THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CXI. No. 2472.] LONDON, SEPTEMBER 27, 1910. [62ND YEAR. PRICE 6d.

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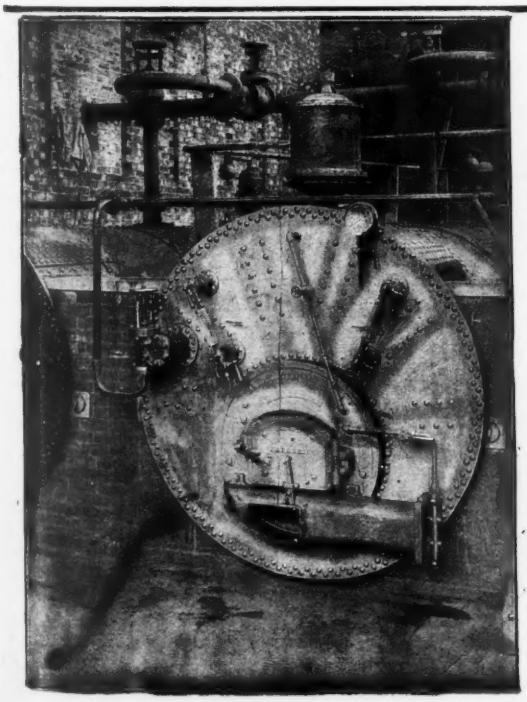

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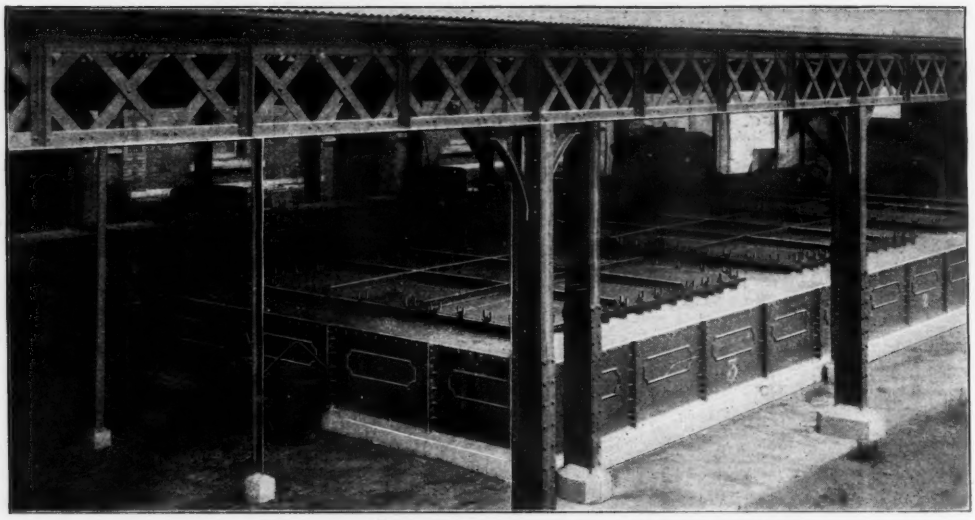

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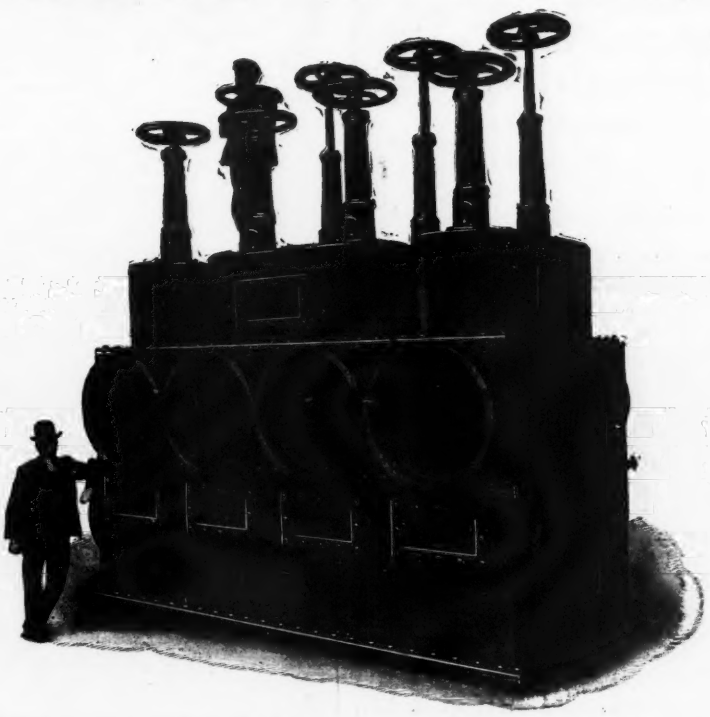

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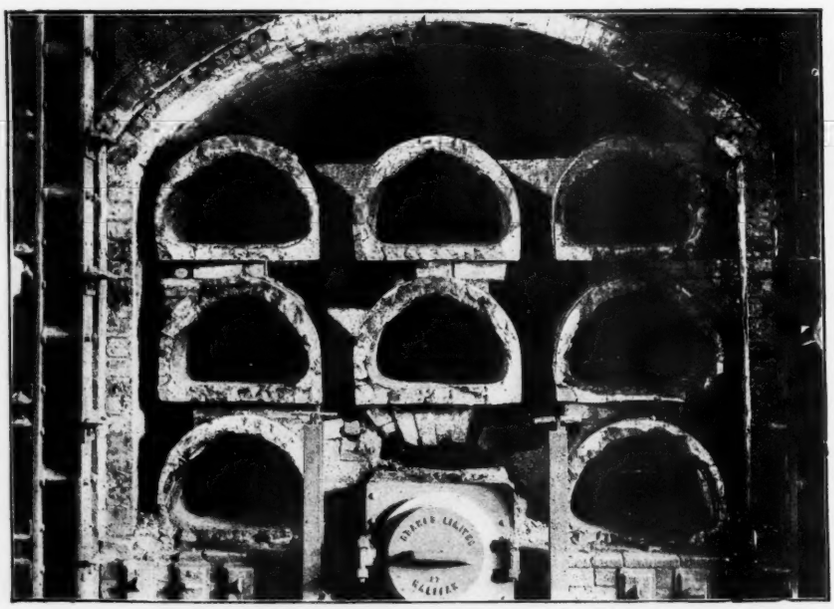

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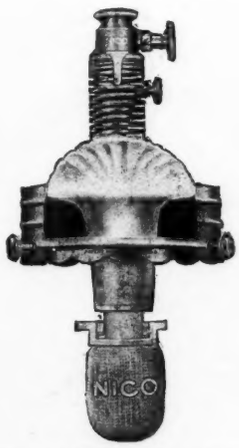

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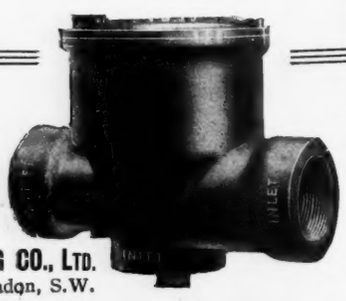

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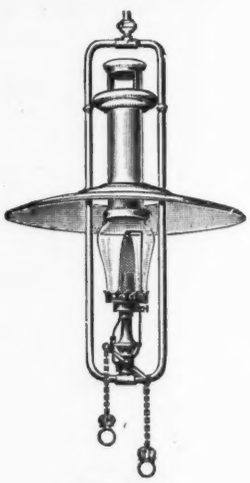

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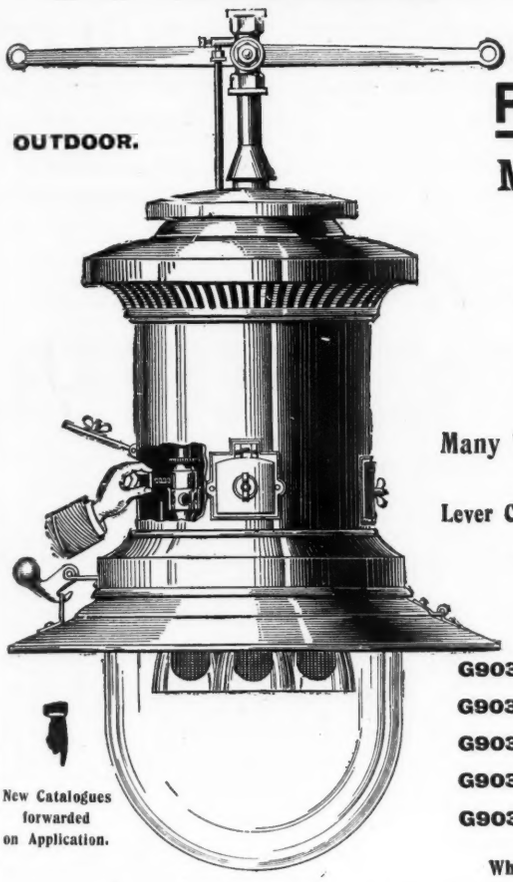

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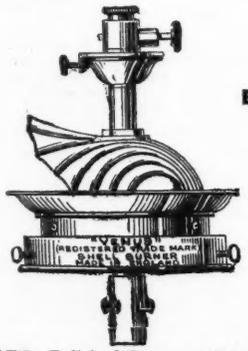

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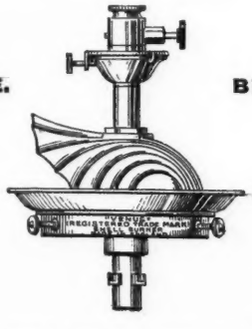

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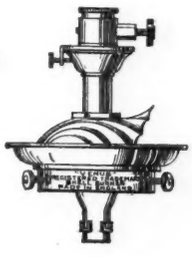

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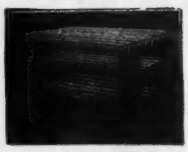

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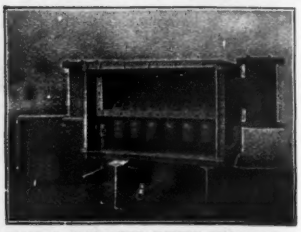

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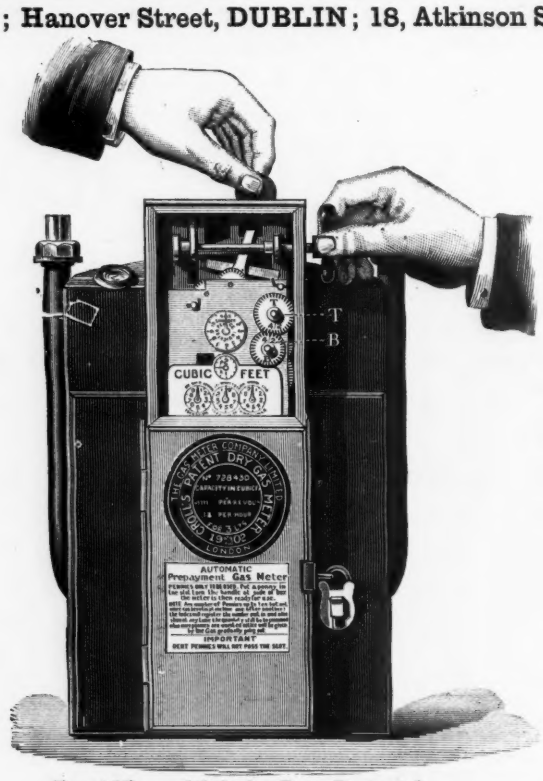

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110 Candles for under 4 feet of Gas per hour.

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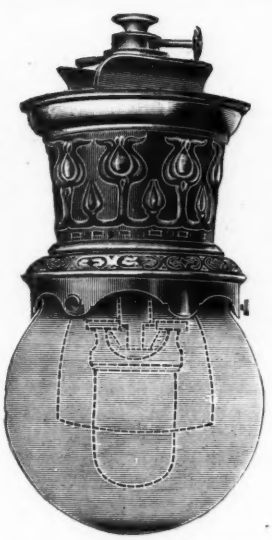

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Augsburg, Bavaria	425,000	G. L. & C. Co., Bromley	3,750,000	Prague, Austria	140,000
Aylesbury	150,000	G. L. & C. Co., Fulham	1,750,000	Preston	1,400,000
Barmen-Rittershausen	500,000	G. L. & C. Co., ,, (2nd)	750,000	Reading	1,000,000
Barrow	300,000	G.L. & C.Co., Kensal Green	2,250,000	Redhill	275,000
Barrow (2nd)	500,000	G.L. & C.Co., ,, (2nd)	2,250,000	Redhill (2nd)	300,000
Bath	1,000,000	G. L. & C. Co., Nine Elms	2,750,000	Reichenberg, Bohemia	200,000
Belfast	1,700,000	Gablonz, Austria	140,000	Reichenberg (2nd)	200,000
Belfast (2nd)	4,500,000	Gelsenkirchen, Westphalia	175,000	Revel, Russia	350,000
Benrath, Germany	125,000	Gelsenkirchen (2nd)	350,000	Rhymney Valley	175,000
Berlin—Charlottenburg	2,500,000	Geneva, Switz.	500,000	Romford	300,000
Berlin—Rixdorf	650,000	Gosport	200,000	Romford (2nd)	350,000
Berlin—Rixdorf (2nd)	700,000	Göteborg, Sweden	300,000	Rotterdam, Holland	850,000
Berlin—Tegel	3,500,000	Göteborg (2nd)	600,000	Rotterdam (2nd)	1,500,000
Berlin—Tegel (2nd)	6,350,000	Graudenz, Prussia	200,000	Rotterdam (3rd)	750,000
Bilston	375,000	Guildford	350,000	Rotterdam (4th)	750,000
Birmingham	1,500,000	Guildford (2nd)	200,000	Rotterdam (5th)	600,000
Bishop's Stortford	200,000	Haarlem, Holland	850,000	St. Albans	700,000
Bochum, Westphalia	530,000	Hamburg, Germany	1,750,000	St. Gallen, Switz.	225,000
Bognor	100,000	Hampton Court	500,000	St. Gallen (2nd)	225,000
Bordentown, N.J.	125,000	Hampton Court (2nd)	600,000	St. Joseph, Mo.	750,000
Bournemouth	1,000,000	Hartlepool	750,000	San Paulo, Brazil	700,000
Bournemouth (2nd)	500,000	Hebden Bridge	200,000	Santiago de Cuba	400,000
Bremen, Germany	550,000	Heidelberg, Germany	200,000	Scarborough	800,000
Bremen (2nd)	950,000	Holyoke, Mass.	600,000	Schwelm, Westphalia	100,000
Bremen (3rd)	850,000	Hong Kong	450,000	Shanghai	225,000
Brentford	1,200,000	Hull	1,500,000	Shanghai (2nd)	225,000
Brentford (2nd)	850,000	Ilford	650,000	Shanghai (3rd)	1,600,000
Brentford (3rd)	350,000	Innsbruck, Austria	200,000	Southampton	800,000
Bridgwater	200,000	Ipswich	750,000	Southampton (2nd)	500,000
Bridlington	150,000	Kampen, Holland	350,000	Southampton (3rd)	600,000
Bridlington (2nd)	200,000	Kiel, Sleswig	1,000,000	Southgate	400,000
Brieg, Silesia	100,000	Kiel (2nd)	880,000	Southport	750,000
Brighton	1,750,000	Kolozvar, Hungary	100,000	Southport (2nd)	900,000
Brighton (2nd)	1,850,000	L. & N.W. Rly., Crewe	700,000	South Shields	650,000
Bromley	1,500,000	Lausanne, Switz.	250,000	Stafford	500,000
Bruges, Belgium	200,000	Lawrence, Mass.	400,000	Staines	600,000
Brussels—Anderlecht	350,000	Lea Bridge	350,000	Stettin, Germany	880,000
Brussels—Anderlecht (2nd)	350,000	Lea Bridge (2nd)	350,000	Stockholm	1,500,000
Brussels—Forest	1,000,000	Lea Bridge (3rd)	400,000	Stockholm (2nd)	1,750,000
Brussels—Koekelberg	1,000,000	Lea Bridge (4th)	1,000,000	Stockport	600,000
Brussels—St. Gilles	1,000,000	Leeuwarden, Holland	400,000	Stockport (2nd)	600,000
Brussels—St. Josse	1,000,000	Leiden, Holland	500,000	Stockport (3rd)	400,000
Brussels—St. Josse (2nd)	600,000	Leiden (2nd)	575,000	Stockton-on-Tees	500,000
Brussels—St. Josse (3rd)	775,000	Leigh, Lancs.	350,000	Swansea	750,000
Brussels—Ville	750,000	Lemberg, Galicia	260,000	Swansea (2nd)	1,000,000
Brussels—Ville (2nd)	750,000	Lemberg (2nd)	500,000	Swansea (3rd)	450,000
Brussels—Ville (3rd)	1,500,000	Liége, Belgium	1,000,000	Swindon	300,000
Brussels—Ville (4th)	350,000	Liége (2nd)	750,000	Swindon (2nd)	450,000
Bucarest, Roumania	1,100,000	Lincoln	500,000	Sydney—Harbour	500,000
Budapest, Hungary	50,000	Liverpool	3,500,000	Sydney—Harbour (2nd)	500,000
Budapest (2nd)	1,750,000	Liverpool (2nd)	4,500,000	Sydney—Mortlake	500,000
Carlisle	600,000	Liverpool (3rd)	750,000	Sydney—Mortlake (2nd)	500,000
Carlsruhe, Germany	500,000	Longton	600,000	Syracuse, N.Y.	850,000
Chigwell	350,000	Louvain, Belgium	800,000	Taunton	225,000
Chorley	300,000	Lübeck, Germany	400,000	Taunton (2nd)	350,000
Commercial, London	850,000	Maastricht, Holland	200,000	The Hague Holland	1,000,000
Commercial (2nd)	850,000	Magdeburg, Germany	1,400,000	The Hague (2nd)	500,000
Commercial (3rd)	1,250,000	Maidenhead	225,000	Tilburg, Holland	400,000
Commercial (4th)	2,000,000	Maidenhead (2nd)	225,000	Torquay	350,000
Copenhagen	700,000	Maidstone	500,000	Tottenham	750,000
Copenhagen (2nd)	2,500,000	Malines, Belgium	500,000	Tottenham (2nd)	750,000
Courtral, Belgium	250,000	Malmö, Sweden	350,000	Tottenham (3rd)	350,000
Coventry	600,000	Malta	400,000	Tottenham (4th)	1,000,000
Coventry (2nd)	600,000	Manchester	3,500,000	Tottenham (5th)	1,000,000
Cracow, Galicia	200,000	Manchester (2nd)	3,500,000	Tottenham (6th)	1,250,000
Cracow (2nd)	200,000	Mansfield	330,000	Tunbridge Wells	1,000,000
Crefeld, Germany	500,000	Marlborough	100,000	Utrecht, Holland	1,000,000
Croydon	1,250,000	Mayence, Germany	700,000	Utrecht (2nd)	1,000,000
Croydon (2nd)	625,000	McKeesport, Pa.	500,000	Verviers, Belgium	1,000,000
Croydon (3rd)	625,000	Merthyr Tydfil	300,000	Vienna	3,500,000
Croydon (4th)	550,000	Middlesbrough	1,250,000	Vienna (2nd)	2,500,000
Debreczin, Hungary	100,000	Namur, Belgium	175,000	Waltham	400,000
Deventer, Holland	150,000	Nelson	400,000	Wandsworth & Putney	1,800,000
Deventer (2nd)	200,000	Newburgh, N.Y.	600,000	Watford	300,000
Dorking	150,000	New York	5,200,000	Watford (2nd)	350,000
Dublin	2,000,000	Nictheroy, Brazil	250,000	Wellington, N.Z.	350,000
Dublin (2nd)	2,000,000	North Middlesex	150,000	West Bromwich	550,000
Dublin (3rd)	650,000	North Middlesex (2nd)	200,000	West Ham	1,500,000
Dundee	1,500,000	North Middlesex (3rd)	75,000	West Ham (2nd)	800,000
Dunedin, N.Z.	150,000	Norwich	1,000,000	Weston-super-Mare	350,000
Dunedin, N.Z. (2nd)	275,000	Norwich (2nd)	300,000	Weston (2nd)	350,000
Durham	200,000	Norwich (3rd)	500,000	Wexford, Ireland	100,000
Düsseldorf, Germany	1,000,000	Nottingham	1,000,000	Wiesbaden, Germany	850,000
Eastbourne	1,250,000	Nottingham (2nd)	1,000,000	Winchester	225,000
Edinburgh	2,000,000	Nuneaton	125,000	Winchester (2nd)	125,000
Epsom	225,000	Oberhausen, Germany	175,000	Wolverhampton	1,500,000
Epsom (2nd)	300,000	Oldenburg, Germany	200,000	Zwolle, Holland	200,000
Essen	1,400,000	Ostend, Belgium	100,000	Zwolle (2nd)	200,000

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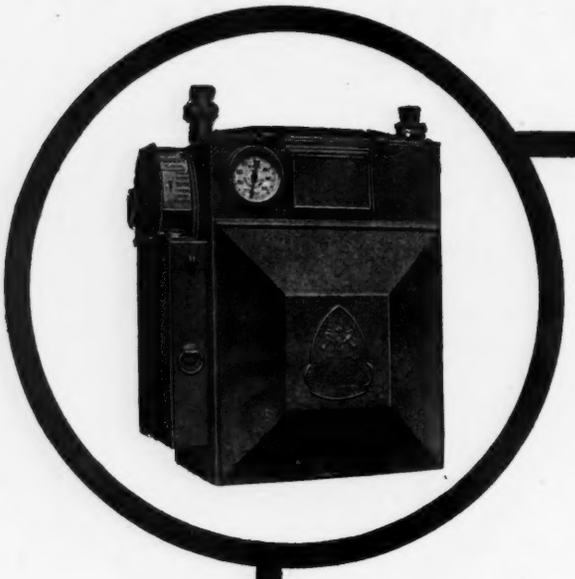

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EDITORIAL NOTES—GAS, &c.

Welcome.

BEFORE the next number of the "JOURNAL" is in the hands of readers, the German guests of the gas profession and industry of this country—to the number of about eighty—will have well advanced into the programme of works' inspection, sight-seeing, and hospitality arranged for them. The gas industry is world-wide; it has no geographical limitations. And it is one of the features of its technical advances that between practitioners of every country there is a give-and-take and community of interest that make for general progress. In the establishment of this intercommunication of thought and ideas and practices, the technical press of each country has, we modestly claim, done a worthy part. Our German friends will be received by the Institution of Gas Engineers, by the Gaslight, South Metropolitan, and Croydon Gas Companies, and by the Edinburgh and Glasgow Corporations as highly skilled engineers and managers who have made fame in the gas industry by their practices and their scientifically founded constructive ability. Members of the gas profession of this country have often crossed the sea to learn of them; and they come again to the mother country of gas engineering and gas practice to learn of us. As they have received their British colleagues in times past, and will do so with no less enthusiasm and cordiality in the future, so we receive them now. There will be absentees from the ranks of the visitors whose unavoidable detention at home we deeply regret. But those who will be with us will well represent the talent and business capacity of the technical ranks of the German gas industry. A cordial welcome awaits them; and the best wishes are expressed for all those conditions that will send them home filled with the enjoyment of their tour, and the renewal of old, and the creation of new, friendships.

Gas Publicity.

THERE is news this week, but still only a modicum, as to what is being done in regard to the formation of a Gas Publicity Committee, and of a plan of campaign. It will be remembered that the matter was discussed at a joint meeting of the Commercial Sections at the time the members of the Institution of Gas Engineers were in session in London in June last; and it was then decided to bring into being a Gas Publicity Committee composed of members of the Commercial Sections, with power to co-opt other gentlemen who may be in a position to be of special value in connection with the work to be undertaken. Summer holidays have cumbered the leaders in the movement; and there are matters of some difficulty that have to be negotiated and disposed of before a concrete scheme can be put forward. It would be of little use to appeal to gas undertakings for financial co-operation with an immature scheme. It must be a concrete and fully-developed one, and launched in no namby-pamby style. The spirit of the work must be infused into the introduction and prosecution of the scheme.

It was Mr. W. E. Price, of Hampton Wick, who gave the information, in a speech at the meeting of the Eastern Counties Association on Friday, that the movement is not dead nor sleeping, but that something definite will shortly be heard concerning it. It is the question of financing the publicity scheme that he wants the chief executive officials of gas undertakings to begin at once to turn over in their minds. We are out to fight; and the thing has to be thoroughly well done, or not at all. The challenge has been thrown down by the electricity industry through its Publicity Committee; and the gas industry has to take up the challenge, and deal with the work of the Electricity Publicity Committee through the same channels and to a like extent, or suffer the consequences of default. To do this properly and effectively, a good round sum must be spent annually. Mr. Price speaks of (say) £20,000 a year. We hear the gasps of not a few of the officers of the gas industry who have had to approach their Boards and Committees for money for other purposes not immediately associated with their businesses. But really when one comes to look into the matter, the sum is not, by co-operation, a big one for the industry. If we take the last-issued Board of Trade returns relating to gas undertakings, it is seen that, in the year dealt with, no less than 173,957 million cubic feet of gas were sold by the statutory undertakings in the United Kingdom; and 2s. 6d. per million on this sale would represent nearly £22,000. It was the Tottenham and Edmonton Gas Company, we believe, that first of all initiated the idea of a 2s. 6d. per million contribution. It will be within the recollection of those present at the last Institution meeting, that, before its close, an announcement was made that that Company were prepared, tentatively for three years, to support a scheme of national advertising on the basis of a contribution of 2s. 6d. per million cubic feet of gas sold, providing fifty other companies would do the same. The sales of the Tottenham Company in 1909 would, at this rate, represent a contribution not far short of £200 a year. Contribution at the rate of 2s. 6d. per million is really a small thing; and yet it is intended to, and will undoubtedly, serve as a big insurance of gas sales.

If in June a scheme of the kind was imperative, it is still more so now. The activities of the Electricity Publicity Committee have since been extensive, and have partly been directed to rubbing the gilt off the gas victories in competitions for public lighting. We are not sorry at the present time to see this activity, though there has been much electrical misrepresentation, inasmuch as the activity is bound to cut into the somnolence and apathy that exist in only too many places in the gas industry. When the enemy is at the very door, it has a stimulating effect within. This national advertising and protection scheme should be received throughout the gas industry with the enthusiasm and material support that it deserves.

The Low-Pressure Inverteds in Westminster.

A DECADE ago, standing before members of the Southern District Association of Gas Engineers and Managers as their President, Mr. Corbet Woodall made use of words which impressed themselves indelibly on memory: "I know "many cities, in many lands; and I am constrained to "declare that London, which saw the first Gas Company "started nearly a hundred years ago, is at this hour the "worst lit capital city in Europe." The disgrace and the reproach that this declaration fixed upon the Metropolis and its local authorities in those days have been minimized but slowly; and, truth to tell, there never has since been a time when the lighting of London, as a whole, could be pointed to as a shining example of what the illumination of the arterial ways and by-ways of the great cities and towns should be. There have been small typical illustrations of good lighting, but nothing more. Incandescent vertical burners took the place of flat-flames; and, in a few main streets, high-power gas-lights appeared. But the local authorities —save those owning electric light undertakings, and a few others upon whom special influence was brought to bear —did not evince any particular desire to mend matters, by extra outlay on lighting, other than by putting up, at enormous expense, electric arc lamps. But a change is now coming over London. The old impeachment has to be considerably modified. The standard of street illumination has been raised; and there is a general movement from the archaic to the modern. For this the ratepayers of London have much for which to thank the Gas Companies. The latter have forced the pace to greater efficiency and economy, and have compelled the electricity suppliers to cut down their grossly extravagant charges for the service they rendered. Still, the Gas Companies, by progress in invention, can and do present the most economical and efficient

means of lighting the public thoroughfares. But though there is this movement from the archaic to the modern, London in its lighting arrangements will ere long represent a big patchwork, in large sections, of various systems of illumination. The streets of huge districts will soon be completely illuminated by the most modern systems of high and low pressure inverted lamps, the contracts for much of which have been obtained in open competition with electric lighting; while, on the other hand, in certain municipal electricity-ridden boroughs, the streets will be shortly entirely given over to electric lamps, and the ratepayers will be paying more for illumination than the ratepayers in those districts that have adopted the latest forms of gas lighting. The comparison in cost and illuminating effect will now have to be, not between what is electrically and what has been in gas lighting—a comparison preferred by Marylebone and the Electricity Publicity Committee—but between what (say) Marylebone, Hampstead, and Shoreditch are doing with what is being done in the City of Westminster, Finsbury, Hackney, Bethnal Green, Stoke Newington, and other districts in the area of the Gaslight and Coke Company, and in several districts served by the South Metropolitan Gas Company.

But, on this occasion, reference has to be made to the lighting of the City of Westminster, which will in a short time be able to claim to be (in all but the districts still under the domination of electric arc lamps which gas lighting has long since left in the rear), any way for the time being, the best-lighted city in the world, from its very heart to the narrow stuffy streets, lined by the abodes of poverty and worse, and which morality, health, and safety demand shall, when daylight fails, be illuminated in the very best possible manner. The high-pressure installation will be completed soon. The steel tubes have almost threaded their way wherever required; and the lamp-columns are now being erected. But the installation of the low-pressure inverted lamps is practically finished; and now shows us how the Gaslight and Coke Company are, by their aid, going to sell illumination under contract, with tests carrying penalties for infraction, in the large area. Electricians have tried to belittle what is being done in Westminster. Taking no note of the high-pressure gas lighting, there are, in this low-pressure installation of special "Nico" lanterns and inverted burners, no less than 2200 lamps and 7000 burners, distributing in the streets in the aggregate hundreds of thousands of candle power.

We have tramped through the streets—streets bounded by the residences of the rich and wealthy, by the shops of the traders of the West-end, by the huge blocks of offices of professional men, by residential flats, and by the homes and lodgings of the poor; and it can be said that never before have those many-charactered streets been illuminated as they are illuminated to-day by inverted burner lamps developing, on low pressure, 30 candles per cubic foot of gas consumed. The rays cover the road and the footpaths, and penetrate into corners and places where at nightfall light has never reached before. It is a fine demonstration of progress in illumination by the modern high efficiency means at the disposal of the gas industry. Whether we walk in roads illuminated by the two-burner, three-burner, or five-burner lamps, the same effects appeal, the same verdict applies; the differences in the degree of light being due only to the differences in the number of burners per lamp—these being justified by considerations of position and traffic. Take the Vauxhall Bridge Road—a main wide road, with tramcars, well patronized by London's workers, passing along it at frequent intervals, with its other heavy vehicular traffic and its thick pedestrian traffic. From the Victoria Street end, one first traverses the portion lighted by electric arc lamps; and then, from Rochester Row to Vauxhall Bridge, there are five-light inverted-burnered lanterns. On walking from the electrically lighted part of the road into the gas-lighted part, it is like passing from dusk of evening into full daylight; and leaving the new lighting to pass on to Vauxhall Bridge, which is lighted by vertical incandescent burners, causes one to be very dissatisfied with that which at one time we looked upon as a model piece of bridge lighting. Progress changes our ideas and our tastes, even in the matter of illumination.

The low-pressure installation in Westminster has been well done; and we are sure that the Westminster City Council, and the Chairman (Mr. Jacques Abady) and members of the Works Committee, will feel the utmost satisfaction with what the Gaslight and Coke Company (we may specially mention Mr. F. W. Goodenough, the Controller of Gas Sales, in this connection) and their contractors, the New Inverted Incandescent Gas-Lamp Company, have done. Details are not required here. They are set forth in the special illustrated article in other columns, in which article there are several useful hints referring generally to public lighting necessities in these times, with special reference to the inverted gas system. Having thoroughly inspected the work done, and the effects, we feel that the new lighting in Westminster marks a stage from which great public lighting developments throughout the country will spring, and that it will assist in securing from the responsible local authorities a more broad-minded treatment of the public lighting service than has (may we not say?) ever before been accorded to it. The Westminster City Council have led the way in a more enlightened policy, and in a most effective manner.

Technical and Commercial Affairs at the Eastern Counties Association Meeting.

The Presidential Address that Mr. J. W. Auchterlonie delivered at the meeting of the Eastern Counties Gas Managers' Association on Friday, at Cambridge (where the members were received in the happiest possible manner), was one that showed a comprehensive grasp of, and interest in, all current matters of policy and development affecting the affairs and operations of the gas industry. The address ought to be taken in combination with the visit of inspection paid to the works of the Gas Company. For in these works were seen materialized the skill and views of the Engineer, which have contributed, with the lines of policy and development that thread themselves through his address, to the production of that satisfactory financial condition which it was the pleasure of his Chairman (Mr. E. H. Parker, M.A., J.P., D.L.) to acknowledge at the luncheon. That the gas industry is displaying great vitality, is seen in the variety of the topic that Mr. Auchterlonie presents in his deliverance. Much endeavour is being exercised in the causes of technical and commercial progress; but all are conscious that there is still a considerable amount of defect that has to be mended, and a largeness of lethargy that has to be dispelled. Both are prominent characteristics of the day. The one is lauded by Mr. Auchterlonie; the other condemned. In carbonization, there is exuberant effort; and old ideas and ideals are fast undergoing change. On this question, we have the President pointing out, by his action rather than by words, that, in the present position of horizontal and vertical retort working, the inclined retort is being passed by. He himself has not seen fit to extend the installation at his works; but he has given preference to the old horizontal in conjunction with the modern modes of projection and ejection, and working generally. But he does not tie himself to this system; and the vertical retort has in him an ardent admirer. There is voicing, too, by the President of the prevalent opinion among the practical and scientific men associated directly with carbonization, that the tilt Professor Armstrong recently indulged in against the carbonizing methods of the gas industry was of quixotic character; and the person most concerned will, without doubt, be interested in the view, very neatly expressed in a lecture by Mr. J. B. Peace (to which we shall be referring presently), "that such indiscriminate combativeness as is "disclosed by Professor Armstrong, in his recent attack "on our methods, is more a personal characteristic than a "professional one."

But it was on the needs of the industry in relation to its commercial work that the President was strong, and made many effective points. He is an earnest supporter of co-operation, and not of the class that expresses sympathy in words, but stops short at the necessary provision to carry on a defensive and educational campaign. "Money," he says, "is badly wanted for safeguarding the interests of the in-"dustry generally." True; but the trouble is to get the majority of boards of directors and gas committees to see this, so long as dividends are maintained, and the amount of surplus profit shows little or no diminution. It seems as though a personal shock of some kind is needed to disturb them from their languor, and show them their error. A mild—but confessedly only a mild—influence might be to direct their attention to the co-operative activities of the competitor, and to a list of those who have, in their own area of supply, gone over from gas to electricity. There are other things to be done, too, in the commercial interests,

and one is to provide suitable men by suitable training for all work that has direct or indirect part in the commercial business of a gas undertaking. The human element, as the President puts it, in the work of a gas undertaking is of an importance that cannot be under-estimated. This is a belief on which the Directors of the Cambridge Gas Company and their chief technical officer act; and in one direction it has found its way to co-partnership.

There is only one other point of the address—though many others invite remark—on which we will make observation. It is this: "If gas undertakings had been suffi- "ciently alive to the interests of the public, we should not "to-day be agitating for a uniform standard for testing the "illuminating power of gas. Such standards would have "been abolished altogether; and a calorific standard would "have been the test in use." It would, in our view, be a mistake to pass too precipitately from the one standard to the other. It is better not to go too hastily, lest mistakes in conditions result that it may hereafter be difficult to remove. The supersession of illuminating power by calorific power as the standard quality, will come; but those entrusted with the management of gas undertakings have preparatory work to do in thoroughly satisfying themselves as to the standard and conditions that it would be wise to accept under the special circumstances of each concern. If there are undertakings already prepared for the change—local authority or company, but preferably the former to escape opposition at the start—and which are going to Parliament next session, why not insert a clause in their Bills for the repeal of the illuminating power standard, and a provision for a calorific power one? The whole industry would watch with singular interest the result of this progressive enterprise.

From the normal lines of thought at their meetings, the members were, on this occasion, drawn by the lecture, on the theory and practice of engineering, delivered to them by Mr. J. B. Peace, M.A., of Emmanuel College, who is one of the Directors of the Gas Company. The lecture comes appropriately in the present position of the affairs of the gas industry. "Echoes still linger of the old quarrel between "the professor and the practical man—between the rule of "the book and the rule of thumb." In the gas industry, at any rate—save maybe here and there—there is no such lingering of the dispute. The evidences of what the gas industry owes to the theorist and the scientific investigator are too material to admit of anything but the desire of the fullest feasible co-operation. No one knows better than the practitioners of the gas industry that observation and deduction alone must eventually bring us to a blank wall, over which it is impossible to pass to make further advance, and that developments from observation and deduction alone frequently embody defect and waste, hidden from the eye and comprehension of the practical man, and requiring for revelation the aid of a different order of reasoning and penetration than he himself can bring to bear. Take the gas-engine, the gas-fire, the gas-burner, as examples. They were all more or less subject—they are not in improved form perfect even now—to defect and waste until the theorist and scientific investigator stepped in to assist the practical man. The same in regard to the whole of the operations attending the production of gas and the serviceable development of the residuals. All are controlled and regulated by the inventions of theory and science.

It is quite true that the gas engineer and manager himself is too busy, as Mr. Thomas Glover says, working for the best issue in his balance-sheet, to think much of theory and fundamental principles. But, at the same time, the balance-sheets of gas undertakings would not be what they are to-day had it not been for the assistance rendered by those who, by the promptings of theory and the disclosures of scientific research, have turned waste into profit. In the constructional work of gas undertakings, in the use of the raw materials, and in the produce of those materials, there has been great waste in past times. But that has been, and is still being, changed. "In every art, in every science, "the spirit of inquiry, of research, is the one essential con- "dition of advance. Without it, the old routine, sufficient "in its time, lingers on to find itself helpless in the days of "fresh demand and new conditions." That has been accepted in the gas industry as an indisputable truth; and this has been attested in the most practical way by linking the industry with one of the recognized seats of industrial learning and research, in order that it may be the better equipped for meeting all the fresh demands and the new conditions. Through this association, the gas industry are hoping, as time passes, to eradicate much old defect and misconception, and gain new ground in economy and efficiency. The industry likewise welcomes the work that is being done in different directions, through Committees of the British Association, in separating useful knowledge from error—more especially in connection with internal combustion engines—and putting the results freely at the disposal of practical men, thereby giving them fresh points from which to work for greater efficiency. There is still waste in the gas industry—in its operations and in its methods of utilization. So long as there is waste, there is work to be done on processes as they exist, in addition to that which is necessary to secure advance. We do not recognize any finitude in the useful ends of the gas industry; and so long as there is no such recognition, so long will there be no questioning, other than by the narrow-minded and short-sighted, of the value of the co-operation of theory and practice.

The Coalite Position.

Prospectus promises falsified, not one penny piece yet distributed in dividend, prices of shares reduced to next to vanishing point, plant undergoing repeated remodelling, and much plant idle. There one has summed up the present position of the British Coalite Company's affairs after three years' working from the time the concern was called into being as the channel by which something great and revolutionary was to be performed from an already, on paper, good and commercial scheme. Readers can easily piece together from our pages the whole history of this project, which never has had a sound technical foundation upon which to build a good commercial structure. The noise originally made by the promoters, the pretty pictures drawn from their vivid imaginations, the easy manner in which the newspapers were gulled into giving support to the scheme, the intoxication of those who became shareholders by visions of golden gain, their hopes and aspirations, their disappointments, the abandoning of the Company by first Directors, and the incoming of other good, receptive souls such as Sir William Preece, are matters composing well-known history now; and there is only speculation as to what the end will be. But how the present Directors must now regret that they were less sentient than those who preceded them, and who retired. We do not envy the Board their next appearance before the shareholders some three months hence, when a further tale of the falsification of prediction will have to be spun.

The "Daily Chronicle" has been doing some service to the public and to the shareholders by piecing together into narrative form the facts regarding the Company that might have been found for most part scattered in our pages, and presenting the lugubrious result to their readers. We have reproduced (last and this week) the principal parts of the matter—not so much because it tells us anything that was not known before, but because it focuses certain of the main events in the history of the Company. The financial, technical, and commercial positions, it will be seen, all have "failure" written above them after three years' working. One of the latest interesting schemes of the Company was the supply of coalite plant to gas-works on very seductive terms; and from these plants profits were going to be made for the despairing coalite shareholders to the tune of some thousands a year. Alas! the numerous "negotiations" of which there was talk do not appear to be working out in the way intended by those who have been scheming to promote the salvation of the Company. We hear nothing to-day about successes in making terms with gas-works. Little is heard of the plant at the Plymouth Gas-Works; the Hythe plant, it is believed, has not been re-started yet; the Wednesfield plant, it is understood, is not working; and the Barking works (which were "going to be" capable of dealing with about 3 million tons of coal) are reported to be a painful scene of desolation. Grass, if the "Chronicle" man speaks truly, is the most prolific product of the site, machinery is stationary, gasholders and hoppers are rusting. These are the works round which a big gas-driven electrical power scheme was going to spring up; these are the works that should be tearingly busy now producing coalite with which to stock the cellars of a London that was supposed to be absolutely languishing for coalite. Only the noise of men engaged in repairs or some such work, it is said, disturbs the stillness. Going further afield, it is not noticed that the Coalite Company are exhibiting at the Glasgow Smoke Abatement Exhibition, while their

competitors are doing so. We wonder whether shareholders at their next meeting will be content with the cheery assurances and optimism of Sir William Preece, and go away from the meeting feeling that "all's well." The optimism and the facts have no congruity. Meanwhile, many of the shareholders are doubtless reflecting over the fact that cunning brains have constructed many asses' bridges in the City, and are regretting their misfortune in having been tempted to cross one of them.

British Gas Company Finance.

The British Gaslight Company, Limited, are presenting a strong financial position in these times; and therefore the Chairman of the Company (Mr. J. Horsley Palmer) was last Wednesday happy in the tale he had to tell. The Hull undertaking has such a sound financial backing that the Board feel fully justified in reducing the price of gas from 2s. to 1s. 10d. per 1000 cubic feet. There was a day when Hull was able to rejoice in gas in the Company's area at a price of 1s. 9d.; so only another 1d. reduction will be needed to bring it back to its best record. The cost of coal, renewals, and increased expenditure in various directions, have accounted for the necessity of the price being for some time 3d. above its lowest point; but the Company and their Engineer at the station (Mr. John Young) are to be congratulated upon the price once again coming down to a figure that makes the gas supply one of the cheapest in the country. At Norwich, too, the Company are feeling the benefit of the release from the large scheme of reconstruction and remodelling work that Mr. Thomas Glover has had to cope with there, by which an old-standing legacy has been wiped out, to the extent that conditions will allow. The references of the Chairman to Norwich were highly complimentary, and deservedly so. Among other matters, Mr. Palmer had something to say on the practice of the Company in paying dividends clear of income-tax; but he has a preference for paying dividends with the tax deducted. Whether the tax is deducted, or whether the dividends are paid clear of the tax, appears to make no difference to the prices of stocks or shares on the Stock Exchange. There is a proposal coming forward that, in the case of this Company, the tax shall in future be deducted; but the Directors will see that the shareholders do not suffer in the amount of the income they derive from their holdings. Considering the blindness of the Stock Exchange to the advantage attaching to dividends being paid clear of income-tax, and considering also the hint the Chairman gave as to the shareholders not being injured by the suggested change, we foresee the market value of the British Gas Company's shares appreciating within a measurable distance of time.

The Manchester Juniors and University Lectures.

As will have been seen from the report of the proceedings at the opening meeting of the present session of the Manchester and District Junior Gas Association, which appeared in last week's issue, a scheme of Manchester University Lectures has been brought to fruition; and it is to be hoped that the reception accorded to it will be such as to amply reward those who have taken such trouble in its preparation. Appreciation of what has been so willingly done by those who have been approached on the subject will best be shown by large attendances at the lectures. And these should not be difficult to secure; for, as Mr. F. Thorp, the President of the Junior Association, remarked, the "bill of fare" submitted is an excellent one. The advantage enjoyed by those who are nowadays studying in the gas profession is already universally acknowledged; and the present scheme affords one more illustration. An announcement in our advertisement pages is to the effect that, under the auspices of the Manchester District Institution of Gas Engineers and the Manchester and District Junior Gas Association, a course of six lectures will be given at the Victoria University on the "Science of Gas Manufacture and Combustion;" and that tickets and full particulars may be had from the Hon. Secretaries of the Associations—Mr. W. Whatmough, of Heywood, and Mr. J. Alsop, of Stockport. Admission will be free; and the lecturers will be masters in the particular branches of the subject with which they will deal. An opportunity like this should be jumped at; and if we rightly judge our friends in the North of England, it will be. A further course of lectures was, it will be remembered, also foreshadowed by Mr. Thorp; and of this we shall no doubt hear more anon. Meanwhile, it is in regard to the series of six lectures now announced that we are desirous of enlisting the cordial co-operation of those in the Manchester district who are desirous of furthering the interests of the gas profession.

Gas Legislation.

In other columns, we commence our usual review of the Gas Acts passed during the session of Parliament that has still a few weeks to run before its tale will be finally ended. The half-dozen Acts noticed in this first article are those of new companies seeking incorporation and parliamentary powers and limited companies desiring to raise their statutory status, and who have realized their desire as expressed in the Acts before us. But in dealing with them, it has been found in the majority of cases that the changes from their initial form are so few, and, so far as any general interest goes, so unimportant, that we have, instead of outlining the principal clauses of the Acts, confined ourselves almost entirely to indicating where they differ from their originals. Chiefly the variations are in the amount of capital sought, or in the proposed standard or maximum prices for gas. In connection with the latter, it will be remembered that all these are companies submitting themselves to parliamentary regulation for the first time; so that in their case it is not an existing statutory standard price that has been altered. There has also been a little trimming-down or modification in other respects. There is one thing, however, in which there is absolute uniformity in the six Bills noticed; and it is that Parliament has agreed to all the companies having the "Metropolitan" No. 2 burner as the one for testing their gas, the standard illuminating power of which is also uniform—viz., 14 candles. The six Acts are the only survivors of the eleven Bills promoted by companies wishing, for the first time, incorporation and statutory powers under Special Acts.

"Cause Unknown."

We do not appear to be getting any nearer to a solution of the cause of the latest fire in a drapery establishment at Brixton, at which one of the lady assistants lost her life by precipitating herself from a bedroom window in her fright. Part of the premises was lighted by gas and part by electricity. But at the resumed inquiry by the Coroner (Mr. Wyatt) last Thursday, the Fire Brigade officers who had been engaged in investigating the cause of the outbreak, were as far off determination as before. But gas was exonerated by Superintendent Allison of the London Salvage Corps. He says that he does not think the gas-jets had anything to do with the fire. But he has not the slightest doubt that the fire originated underneath the stairs in a cupboard. On the other hand, District Officer Woodger is of opinion that it occurred in or near one of the shop windows; and these windows, we know, were electrically lighted. However, there is a diversity of opinion; and the origin of the fire remains still a mystery. Therefore, it can only be concluded that this will make another addition to the rapidly lengthening list of fires coming under the category of "Cause unknown." The Electricity Supply Company were again represented by Counsel at the inquest.

Office Heating, and a Discount.

The heating of offices in industrial and commercial centres makes in itself an important branch of winter business; but not in all cases is sufficient attention paid to it. For such use, the old coal fire is extravagant, and in view of the attention and labour involved, is a positive nuisance to the business man. A writer in the "Financial Times" (with its large circulation among business men and financiers) has been expatiating on the subject. He is obviously a partizan, and has an eye to only one means of circumventing the trouble and nuisance of a coal fire—that is the electric radiator. He has little to say about the expense. In this he shows wisdom. It is strange he overlooks the gas-fire, which is far more efficient as a heater than the electric radiator; while all the advantages he attributes to the latter are obtained by the former. There is the handiness. The gas-fire can be turned on and off just as required; and its range of regulation is greater. Heating by it, too, is much more expeditious. Like the electric radiator, the gas-fire does not make the air impure, nor does it give off fumes. As a matter of fact, it is constantly causing fresh air to be drawn into the room in which it is used, and the ejectment of air from the room. Circulation of air in this way is not

induced by the electric radiator. There is one matter to which the writer of the article makes pointed reference; and it is that "as regards cost for electricity used for heating purposes, the supply companies give a very special low rate for all current used for radiators." This is a matter that may be worth consideration. Consumers like the notion of a good discount or rebate. It appeals to them; and it is a potent factor among people whose business is commercial or financial. To allow a rebate for the gas used for fires, it is unnecessary nowadays to have a dual system of piping and a second meter. A small discount meter fixed near the gas-fire answers the purpose. There are places where such meters have been introduced with good effect; and where they have been introduced, report says, they will stay.

Promotion of Health and Cleanliness by Local Authorities.

Mr. J. G. Newbigging, the Corporation Gas Engineer of Manchester, got close to this subject at a dinner the other night, which ended an interesting day for the members of the City Council, part of it having been spent inspecting the nearly completed mammoth gasholder (of approximately 10½ million cubic feet capacity), which will stand as a monument to the work for Manchester of the Gas Engineer. Mr. Newbigging was replying to the toast of his health; and his thoughts and words ran on the question of the supply of cheap gas by which coal could be displaced as a heating agent. More sanitary conditions of the atmosphere would mean an improved health-sheet for the community and an increase of cleanliness. To this end, the duty of local authorities is to do all they can to remove obstacles from the path of a cheap supply of gas. It was a smart point that Mr. Newbigging made in this connection, when he said, to effect this cheapness, he would rather see gas and electricity rate-aided than rate-aiding. If these views were held generally in the Council, Manchester would before very long be atmospherically a far different city.

On the Horns of a Dilemma.

The representatives of the South Wales miners are in a position which appears to become less and less tenable as time goes on. Though nominally the "leaders" of the men, they are evidently no longer able to effectively impress their views as to policy on those who are supposed to "follow." Consequently the employers are having forced on them rapidly accumulating evidence that an agreement with the Federation Executive does not necessarily mean an agreement with the general body of miners. The latest evidence of this is the fact that, a few months after the signing of an agreement the very object of which was to guarantee stable conditions over the field for a fixed number of years, a decision has been arrived at by the miners to take a ballot on the question whether there should be a general coalfield strike in support of a sectional dispute. At a meeting of the Conciliation Board, the owners pointed out that the proposal was a breach of the wages agreement; and the men's leaders, though denying this, admitted that their official recommendation on the subject had been defeated and their advice rejected. They had therefore to do something; and the decision to have a ballot was the step which they ultimately persuaded the conference to take. It was added that they felt so deeply the rejection of their recommendation, that the question of resignation of their official positions on the Executive, "if not actually discussed, was fully present in their minds. Under other circumstances they might have taken this grave course, and allowed the policy of the Federation to fall into other hands; but it was their unanimous view that the situation did not call for so serious a step." This explanation no doubt is the correct one; but, of course, it does not touch the real point of the coalowners' complaint, which is that the adoption of a proposal so antagonistic to the spirit of the agreement, under the circumstances set forth, is calculated to disturb the confidence of the owners in the power of the workmen's leaders over the men. If this kind of thing went on, it was truly pointed out, they would never be able to rely upon the leaders carrying out any agreements which might be arrived at. This, of course, is the *crux* of the whole matter; and it is a development of the Trade Union system which can only be regarded with the gravest misgiving. In the present case, the admission at the meeting of the Conciliation Board of the workmen's representatives that "they had to carry out the instructions of the delegates' conference or resign," sums up the matter in a light which cannot be welcome to the other party to an agreement solemnly entered into by the leaders on behalf of the men.

Another Wreck.

The Mid-Oxfordshire Gas Company has become a wreck. It was the expected that happened; and after the condemnation by a Committee of the House of Commons of the whole financial side of this promotion of one of the groups of City company mongers (of which the central figure is Mr. E. O. Preston), it is difficult to feel any amount of sympathy, except for those who acted in absolute ignorance, for many of those who have lost money in the concern. The report of the Assistant Official Receiver which was presented at a meeting of creditors and contributories, gives a great many dry financial details, which in the eyes of the competent in gas-works affairs tell a tale of gross over-capitalization. It is merely the "opinion" of the Official Receiver that this is one cause of the failure of the Company; a second cause being inefficient management. But however good the management might have been, it could never have ensured success on the financial conditions built around the concern for the sole purpose of enriching those who were responsible for the promotion and subsequent proceedings. There is much more to be discovered beneath the bald figures of the report published elsewhere; and the truth of the whole matter can only be disclosed by investigation at the hands of an independent gas expert. A Liquidator was appointed, together with a Committee of Inspection; but the latter is insufficient for the purpose. The view was expressed at the meeting that it was necessary to look beyond the accounts furnished by the Directors and the books of the Company to get at the real position. And that is so.

Obituary.

We regret to learn of the death, on the 5th inst., at sea, on his way home from South America, of Mr. HERBERT GANDON, third son of the late Mr. Charles Gandon, for some years Engineer of the Crystal Palace District (now South Suburban) Gas Company. Deceased was originally with his father at Lower Sydenham; but early in 1900 he obtained the appointment of Superintendent of the Neepsend works of the Sheffield United Gas Company, in succession to Mr. Alexander Allan, who had gone to Nelson. Five years later, Mr. George Martin, the Manager of the Ceará Gas-Works, had to relinquish his position and return to England; and Mr. Gandon was selected to discharge the duties. His engagement was for three years; and in 1908 he came to England on a visit. He, however, renewed the contract for a similar term, and returned to Ceará. At the annual meeting of the Company last October, the Chairman (Mr. F. A. Wallroth) referred in very appreciative terms to the work that Mr. Gandon and the staff had done. Deceased was in his 43rd year; and the cause of death was heart failure.

Personal.

Mr. GEORGE BRAIDWOOD, of the Glasgow Corporation Gas Department, formerly Hon. Secretary of the Scottish Junior Gas Association (Western District), has been appointed Assistant-Manager to the Coatbridge Gas Company, in terms of the advertisement which recently appeared in the "JOURNAL." There were 84 applications for the position.

The "Journal für Gasbeleuchtung" reports that Dr. HANS BUNTE, the Editor of that journal, and Professor at the Technical College at Carlsruhe, has been elevated from the rank of Geh. Hofrat to that of Geh. Rat, or Privy Councillor. Also that, on the occasion of the 80th birthday of the Emperor of Austria, Herr CHRISTIAN BOLZ, the Technical Manager of the Austro-Hungarian Gas Company at Buda-Pest, had been invested with the Order of the Iron Crown, in the third class.

At the meeting of the Tynemouth Town Council last Wednesday, Mr. JAMES WEIR M'KERROW, Assoc.M.Inst.C.E., Surveyor to the Morpeth Rural District Council, was appointed Secretary and Manager of the Water Department of the Corporation, in succession to Mr. Henry Clarke, who had been 45 years in the service of the Corporation and their predecessors, the Water Company. Before going to Morpeth, Mr. M'Kerrow, who is thirty years of age, was for upwards of five years with the Newcastle and Gateshead Water Company.

Mr. J. W. BROWN, the Assistant Engineer and Manager at the Matlock and District Gas-Works, has just obtained the post of Manager to the Chapel-en-le-Frith, Chinley, and District Gas Company, Limited. He is not yet 25 years of age, and was for four years pupil at Matlock, leaving there to gain experience in constructional engineering with Messrs. S. Cutler and Sons, with whom he remained for nearly four years. Mr. Brown has been at Matlock as Assistant for two-and-a-half years. The appointment promises to be immediately an exceptionally busy one; contracts for laying over 5 miles of new mains and fitting up upwards of 500 slot installations having just been settled.

THE WESTMINSTER NEW PUBLIC LIGHTING CONTRACT.

Details of the Low-Pressure Lighting by "Nico" Lamps and Burners.

INTEREST in the new public lighting contract of the City of Westminster has been largely concentrated on the high-pressure gas section of the lighting, inasmuch as in it are comprised certain world-famous centres and streets in which the high-pressure lamps are deposing high-power electric arc lamps. But it must not be forgotten that by far the larger portion of the contract refers to lighting by low-pressure inverted lamps in considerable districts, involving some 2200 lamps and something like 7000 burners. This in itself is a contract of no mean order; and it is subject to the same stringent conditions as the high-pressure lamps. Precisely as in the case of the latter lamps, the Gaslight and Coke Company are selling illumination, subject to strict penalty tests, and not gas at a certain price and undertaking maintenance at a quoted figure. They are selling, and the City Council are purchasing, light of a stipulated value as tested at the angles of 50° and 20° by the street photometer. This being so, the Gaslight and Coke Company had to exercise the utmost prudence in the selection of both lamps and burners, and, in the selection, special consideration had to be paid to the questions of economy in time, of manufacture, and expense in maintaining the lamps up to the standard set by the contract. Choice fell upon the latest design of the "Nico" street burner and lantern; and the New Inverted Incandescent Lamp Company are to be heartily congratulated upon their success—more especially when it is remembered that not upon them but upon the Gaslight and Coke Company rests the entire responsibility of answering to the Westminster City Council for their contract quantity of light. Under the peculiar circumstances of this contract, there will be a desire, among those responsible for public lighting elsewhere, to receive information concerning the lamps and burners, as well as other details and disinterested impressions.

THE BURNERS AND THEIR EFFICIENCY.

In the development of the new "Nico" street-lamp burners and the series of lanterns, such as have been adopted by the Gaslight and Coke Company for the city of Westminster, much thought, experiment, and trouble have been expended in designing a combination that would prove highly efficient in illuminating power, economical in upkeep, and capable of withstanding the stresses of the severest of climatic conditions. As in the development the burner received first consideration, and the design of the lantern succeeded, so in this description the same order may be followed. But there is one point connected with the burners that necessitates a feature of the lantern tops being at once referred to. The burners (which are of the same type all through the 2200 lanterns) being of angle form, the New Inverted Company were able to dispense with the hinged top which is usually the vogue in street lanterns specially made for inverted burners, and to construct the tops with wind and rain proof inspection doors. By this means, there can be expeditious adjustment at any time, during lighting hours or otherwise; the gas and air regulators being exposed immediately the inspection door is opened. Through these doors, too, the burners (being only fixed by a slip union joint) can be readily removed should occasion demand. Each burner has its own means of regulation; and when the gas supply is once adjusted, the needle is made fast by means of a lock-nut on the handle of the regulator. This will be recognized as being a necessary security in streets where the traffic is great and the vibrations consequently severe. By this arrangement, there is no possibility of the gas-regulator, when once it is set, being affected by any vibration to which it may be subject. Then, again, the burners (which, by-the-by, are registered, as are also the lanterns), although highly efficient, are of very simple construction; and no matter for what length of time they may be in use, the efficiency will be maintained. For street-lighting, the strength of an inverted burner and its protection are important considerations. These burners are made of heavy cast brass; and the short pendant part of the bunsen in close proximity to the mouthpiece is protected by a heat-resisting material. The burners are made to take standard size mantles. It should, however, be mentioned that the burners allow a very good margin of adjustment. They can easily be set to pass varying quantities of gas within a range of 2½ to 5 cubic feet according to requirement; the only difference being that, with the smaller consumptions rather shorter mantles are employed.

Two-Light Lantern.

Three-Light Lantern.

Five-Light Lantern.

An interesting matter, in view of the contract conditions as to illumination, is the efficiency of the burners. This is no less than 30 candles (maximum) per cubic foot of gas consumed per hour; so that the duty rendered by a burner using (say) 3¼ cubic feet of gas per hour, is therefore (to be within the mark) 100 candles.

THE NEW "NICO" LANTERNS.

With regard to the lanterns, in their design, consideration was specially paid to the various points that experience shows are demanded in a good street lantern for lighting by means of inverted gas-burners. The lanterns must be of good strength, give facilities for rapid attention to the parts vital to the maintenance of efficiency, must allow of the ready cleaning of the inside surfaces of the glass, must be constructed so that the shadows thrown by the ribs are neutralized as much as possible, and withal they should be neat and of graceful appearance. Street lanterns ought not to be, and there is no occasion for them to be, a disfigurement to the streets. There are many ancient specimens still in active service whose early destination should be the scrap-heap. They are out-of-date, ineffective, and an eyesore; but in the streets of London, there is a present passing of the old, and an incoming of the new in this respect. The new "Nico" lanterns as now seen in numerous streets in Westminster—the types are here illustrated—have a very graceful appearance; and examination enables one to pronounce the workmanship as being of a very high order. The one and two-light lanterns are made with two curved panes; and therefore have only two ribs, one of which faces the roadway and the other the houses or whatever else borders the pathway. Thus, if one looks through a successive number of the lanterns as fixed in a street, one gets an unimpeded view through them. There is not the slightest obstruction to the illumination lengthwise of the roadway; and on the two sides there is an infinitesimal shadow thrown by the ribs—this being largely neutralized by the position of the inverted mantles. The lanterns are made of strong copper, with a lead corona. In the one and two light lanterns, only one inspection door (already referred to in the paragraph treating of the burners) is required in the head through which the maintenance of burners and their regulation can be attended to. It is obvious the only time it will be requisite

[*Photographs by Borup Bros., Streatham High Road, S.W.*

A Night View in Ashley Gardens.

(Three-Burner Lamps.)

to open the door will be for burner readjustment or cleaning purposes. One of the panes of glass is hinged, and is so contrived that the hinge is not strained when opened for maintenance and glass-cleaning purposes. The two-light lanterns (of which 720 have been installed in the City of Westminster) are mounted on four-armed frogs, with double ladder-bars; and they are fixed on columns which bring the light 12 feet above the roadway.

Taking next the three-light lanterns, of which there are 936 fixed on standards of similar height, and 180 on brackets. These are constructed with three curved panes, and are made with two inspection doors in the head of the lamp—two burners being accessible through one door, and one through the other. The lanterns on standards are mounted on triple-arm frogs, with double ladder-bars. The bracket lanterns are of the same type. The lanterns are constructed on lines similar to those described in connection with the two-burner lamps.

Regarding the five-light lanterns, there are 264 of these installed on standards which bring the light 15 feet above the roadway. They are constructed with four curved panes, two of which are wider than the others; the wider panes facing up and down the street. This arrangement has been found to give the minimum amount of shadow. In the head of the lamp are two inspection doors—one giving access to three of the burners, and the other to two. These lanterns are mounted on four-armed frogs, with double ladder-bars, having scrolls underneath to give them relief.

All the lamps are made with enamelled reflectors, from which glass cylinders surrounding the mantles depend. Of course, if desired, the lamps can be used without glass cylinders; but their employment is recommended, as the efficiency is no doubt increased thereby, and the mantles are protected during the cleaning of the lamps. The lanterns as installed at Westminster are provided with trap doors for torch lighting; but obviously they can be fitted with a flash bye-pass if this system is preferred.

As previously suggested, the day of the old style ugly gas lantern in our streets ought to have long since passed; and we hope to see more and more their replacement by the new form of lanterns. Conversion to the inverted system gives the opportunity to do more in this respect. The inverted burner does not require the perpetuation of any of the bad characteristics of the older forms of lantern; and in these "Nico" lanterns, there has been a successful effort to avoid them. It will be noticed that the lanterns are not cumbrous looking. A thing that is graceful cannot be cumbrous; and these are graceful looking lamps. It will also be remarked that the lanterns are rather more shallow than those commonly made for the upright system. Perhaps it will be of interest to quote the dimensions of the lanterns. The two and three light ones are 36 inches high over all; the diameter is

Night View in Prince Consort Road.

(Three-Burner Lamps.)

Night View in the Vauxhall Bridge Road.

(Five-Burner Lamps.)

18¼ inches at the waist, and 8½ inches at the bottom. The five-light lanterns are 45 inches high; the diameter is 21½ inches at the waist, and 10½ inches at the bottom.

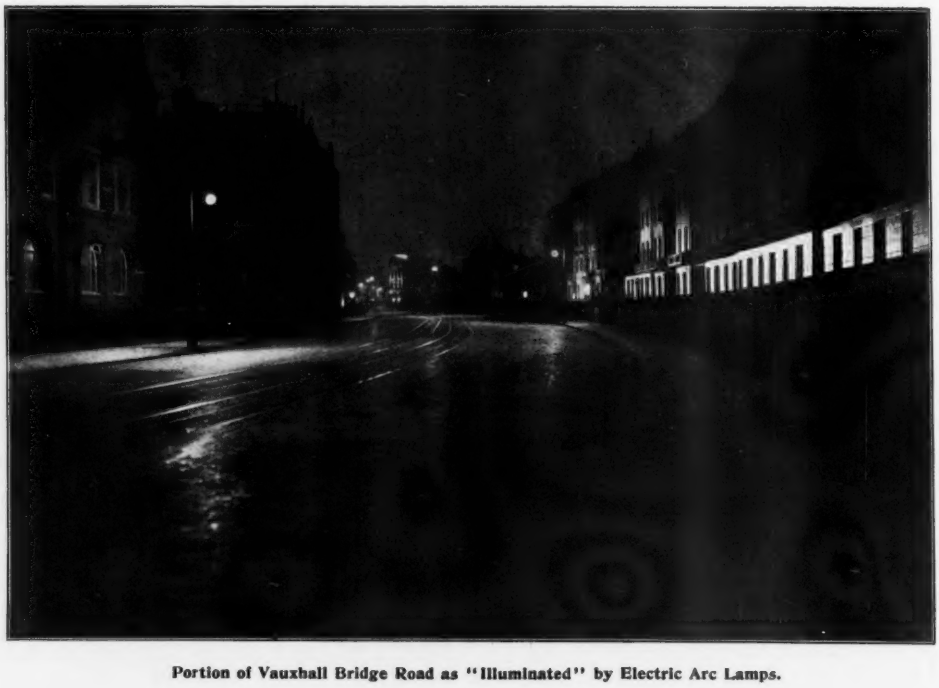
Perhaps we ought to mention here that the New Inverted Company are not binding themselves to this one type of street lantern. They are, we understand, engaged upon the production of a range of square type lanterns for places where the cost of the circular copper lantern cannot be entertained. And, moreover, it is recognized by them that there are many existing lanterns in which the vertical form of burner is used which can be transformed to the inverted system by the use of conversion sets. The Company have made provision accordingly. This, however, is a digression; and we must proceed.

Where the New Lamps are to be Seen.

The City of Westminster covers a considerable area; and it is rather difficult to define its boundary. It extends, for instance, from Temple Bar, taking in the Thames Embankment, to Chelsea Bridge; and the low-pressure inverted lamps are being installed in all the streets other than those in the Strand area in which the Charing Cross Company's contract for electric arc lamps has not yet expired, and those in the district comprising the area formerly governed by the St. George's (Hanover Square) Vestry—whose final act before becoming merged in the City of Westminster was to commit their successors to electric arc lighting for a term of thirty years—and in those streets in which high-pressure gas lighting will reign. Therefore it is impossible to give a complete list of the streets in which the new low-pressure lamps are to be seen. It will, however, assist visitors to the west-end in making an inspection if we mention that, in regard to the two-light lamps, good specimen lighting can be examined in the Soho district, or in Vincent Square, Westminster. The illumination effects of the three-light lamps may be inspected in St. James' Square, or in the area lying between the Haymarket and St. James' Street, as well as Buckingham Gate, and in Horseferry Road, Rochester Row, Ashley Gardens, and other thoroughfares off Victoria Street. As to the five-light lamps, an excellent installation can be seen in the Vauxhall Bridge Road, between Rochester Row and Vauxhall Bridge, in Kensington Road, from the Albert Memorial to Knightsbridge, or in Great George Street, Westminster. It is a really splendid example that is to be seen in the Prince Consort Road, between Queen's Gate and Exhibition Road, at the back of the Albert Hall. Five-light lamps will also be employed in certain situations in other parts of the district.

Acknowledgment and Impressions.

In connection with this Westminster lighting scheme, it would not be right to conclude this notice without saying that great credit is due to the Controller of Gas Sales of the Gaslight and



Portion of Vauxhall Bridge Road as "Illuminated" by Electric Arc Lamps.

Coke Company (Mr. F. W. Goodenough), who went most exhaustively into the merits of the various lamps submitted to him prior to the contract being placed with the New Inverted Incandescent Gas-Lamp Company; and he has naturally taken an enthusiastic interest in the development of the whole work of installation. It may also interest readers to know that the New Inverted Company (who are to be congratulated upon the part they have taken in this historic contract) have also secured the order for the supply of similar lamps for lighting the Boroughs of Finsbury and Bethnal Green. They have spared no pains in the effort to produce in the City of Westminster justification for the trust reposed in them, and in enhancing their own reputation and that of the gas industry. The reward is found in the result. An inspection of the lighting by the new lamps, in certain portions of the areas referred to above, enables us to say that where the lower power low-pressure lamps are employed, there is ample and uniform lighting and, where the high-power low-pressure lamps are installed, the effect is remarkably good. We progress. Consider that where a flat-flame lamp at one time stood consuming 5 or 6 cubic feet of gas per hour, and giving at best only about 15-candle power, now a lamp fitted with inverted burners, using together about the same quantity of gas, will shed a light far around of a value of 150 candles. The change in conditions is magnificent; and what can be done on low-pressure gas supply is richly illustrated to-day in the City of Westminster. It will be idle for the competitors to say the lamps are not doing this or that. The eye itself carries conviction; and the photometers of the Westminster City Council and not of the Gas Company will be the arbiters as to the fulfilment of duty. They will afford sufficient ratification of our own convictions from inspection only. "Westminster," we remember hearing the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall) say, "will soon be the best lighted city in the world." He was then certain, as certain as it is humanly possible to be, of the eventual confirmation. The

Night View in Kensington Road.

(Five-Burner Lamps.)

confirmation is with us so far as the low-pressure installation is concerned; and in but a few weeks, it will be in respect of the high-pressure lighting.

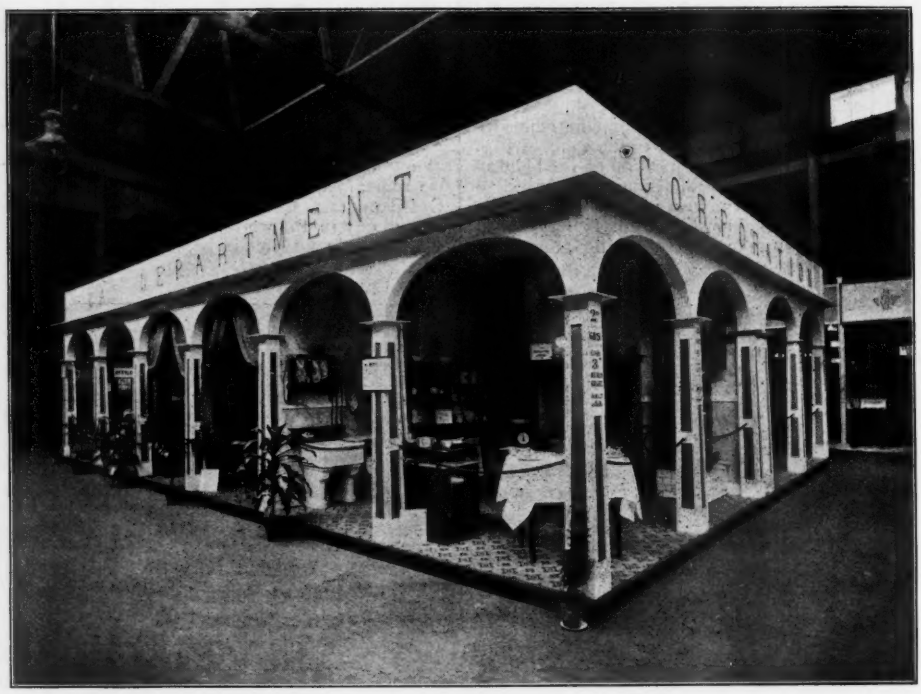
In street lighting, an important essential is that the system shall be the very best under the worst of climatic conditions. Towards the end of August, some tremendously heavy gales and rain-storms were experienced. The inverted mantles used in the "Nico" lanterns stood firm, and were wholly unaffected. The next worst condition will be a dense London fog. It is generally admitted by the public and by competent judges other than those electrically interested, that the light of incandescent gas-lamps has greater penetrating power in fogs than that of electric lamps. With our streets fog-bound, there is faith that these inverted gas-lamps will render a good account of themselves in comparison with electric lighting. We need not make any contrast regarding the economy of the lamps in relation to the electric light or vertical incandescent gas-lamps. The fact of their presence in Westminster to-day suffices to show that the City Council, in the purchase of illumination, found that a better bargain could be struck with the Gaslight and Coke Company than with the Electric Lighting Companies; and, as a matter of fact, some £8000 (or 60 per cent.) is being saved annually in comparison with what the Electric Lighting Companies, on being applied to, were able to offer.

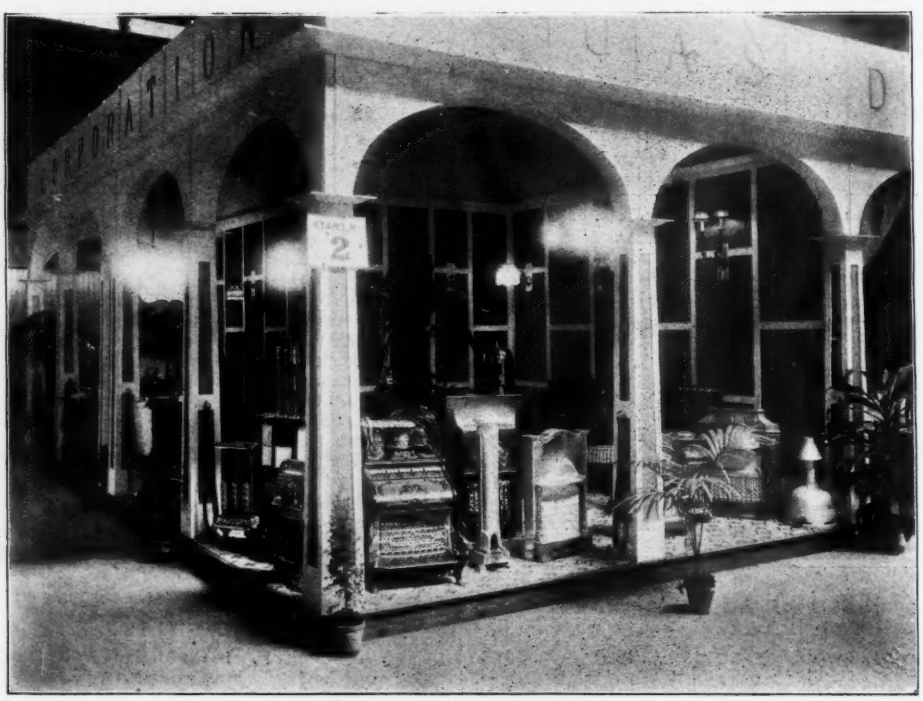
GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 863.)

THE persistent inertia of the Stock Markets was again last week (to devise a so-called Hibernianism) in full action. Nothing seems able to impart a spark of vitality to the sleepers, though they should have awakened from their autumn repose some time ago. So that the state of things on the Exchange last week was pretty well a mere repetition of the week before. The opening on Monday was sluggish enough, and the tone was inclined to be dull and heavy. Government issues were rather weaker, though Consols were unchanged. Railways were lower (disappointed by the protraction of the labour dispute); the Foreign Market was irregular; and Americans were far from strong. Gas stocks were in good demand; and Breweries were still advancing. Tuesday was terribly inactive—hardly any movement being perceptible. Rails were, however, a little more cheerful. Wednesday came and went in unbroken calm. Movements were slight and irregular. The gilt-edged division were rather weaker; and Consols fell $\frac{1}{8}$. But Rails maintained their strength; and the Foreign Market was strong. On Thursday, a shade more activity showed itself here and there, and prices accordingly looked up a little—the strongest lines being Railways, Foreign stocks, Breweries, and Gas. On Friday, things fell back into their old lethargy; but the tone was not weak. Consols lowered $\frac{1}{8}$ for the account. There was scarcely anything to note on Saturday, except that the weak American Market shaped rather better. Railways appeared tired by the long delay in a settlement. In the Money Market, the tendency fluctuated; rates giving way at first and recovering later on. Business in the Gas Market presented a fair aggregate, and the all-round strength of stocks left nothing to be desired—several issues making nice advances. In Gaslight and Coke, the ordinary was strong and active; all transactions being within the limits of 106 and 106$\frac{3}{4}$. The secured issues were fairly busy; the maximum marking 88, the preference from 103$\frac{1}{2}$ to 104$\frac{1}{2}$, and the debenture 80$\frac{1}{2}$ and 81$\frac{1}{4}$. South Metropolitan was more active, and changed hands at from 121$\frac{1}{4}$ to 122$\frac{5}{8}$. The debenture made from 80 to 81$\frac{1}{8}$—a rise of 1. Commercials were quiet. The 4 per cent. realized 105$\frac{1}{2}$ and 106, and the 3$\frac{1}{2}$ per cent. 101$\frac{1}{2}$. Among the Suburban and Provincial group, Alliance and Dublin was done at 85$\frac{3}{4}$ (a rise of 2), ditto debenture at 95 and 96$\frac{3}{4}$ (a fall of 2), British at from 45$\frac{1}{4}$ to 45$\frac{3}{8}$, Brentford new, at 186, and Tottenham "B" at 113—a rise of 1. On the local Exchange, Liverpool "A" was done at 220—a rise of 1. In the Continental companies, Imperial was active at from 186$\frac{1}{2}$ to 187$\frac{1}{2}$, ditto debenture realized 93 and 93$\frac{1}{2}$ (a rise of 1), European fully-paid 23$\frac{3}{4}$, and ditto part-paid 17$\frac{7}{8}$ and 17$\frac{15}{16}$. Among the undertakings of the remoter world, Oriental changed hands at 139 free, Melbourne 4$\frac{1}{2}$ per cent. at 102$\frac{3}{4}$, Primitiva at from 7$\frac{1}{4}$ to 7$\frac{3}{8}$, ditto preference at from 5$\frac{1}{4}$ to 5$\frac{3}{8}$, and ditto debenture at 98$\frac{1}{4}$.

THE GLASGOW SMOKE ABATEMENT EXHIBITION.





In the "Journal" last week, a full notice appeared of the opening of this exhibition on the 16th inst., together with a description of the principal gas exhibits. It was then mentioned that that of the Corporation forms the head of two long lines of stands occupied by appliances for the utilization of gas for heating, cooking, motive power, and lighting, and that a finer display has seldom, if ever, been seen. Above we are able to give two reproductions of photographs of portions of the stands; and we think it will be acknowledged that our correspondent's remarks were justified. Besides the display of "Glasgow" cookers and range fittings as supplied on simple hire, there are samples of gas-fires which may be obtained on the hire-purchase system recently inaugurated by the Corporation. There is also a representative collection of radiators, water-heating appliances, a greenhouse heater, a flashlight advertisement sign, and various other gas-heated appliances for domestic and industrial use. The latest types of lamps and burners, &c., for household and shop lighting are shown. The special gas exhibit of the Corporation is a modern dwelling-house completely furnished in good style, and entirely fitted up with gas appliances. The house (some particulars of the contents of which appeared last week) contains a dining-room, bed-room, bath-room, kitchen, and laundry; and cookery and laundry demonstrations are given. We are pleased to learn from the Manager of the Exhibition (Mr. James M. Freer) that it is attracting considerable public attention, as shown by the fact that during the first eight days the attendance numbered no less than 29,000.

At the Fenton Wesleyan Church last Thursday, the marriage was solemnized of Miss Elsie Mary Surtees, eldest daughter of Mr. R. Surtees, the Engineer and Manager of the Fenton Gas-Works, and Mr. John W. Drewry, eldest son of Mr. G. Drewry, of Fenton. After the ceremony, a reception was held in the Town Hall; and subsequently Mr. and Mrs. Drewry left for Eastbourne.

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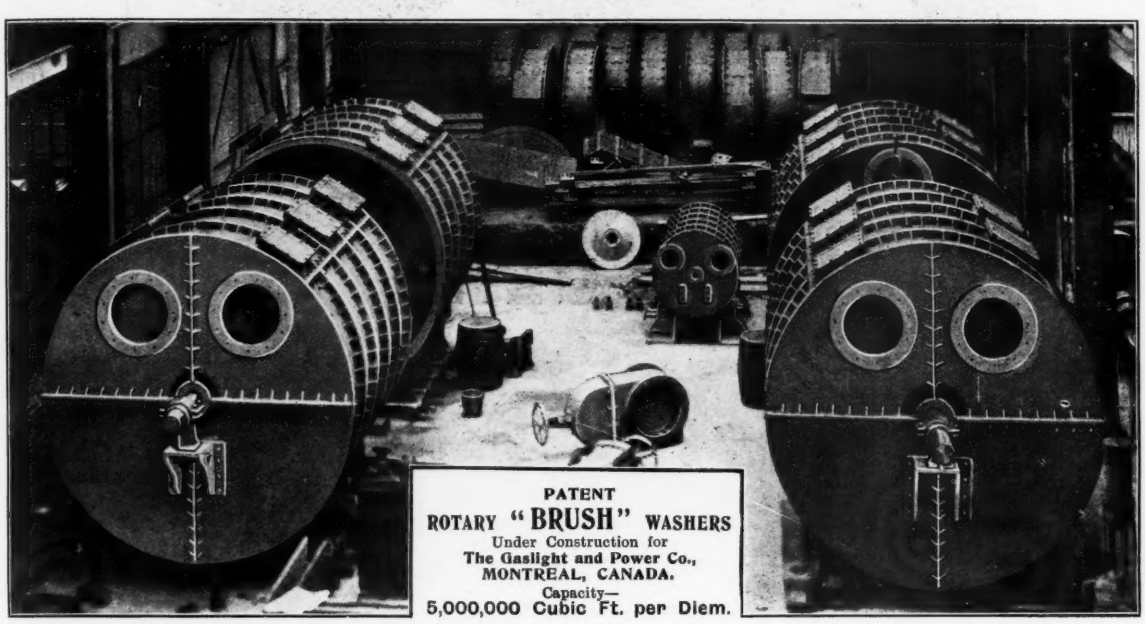

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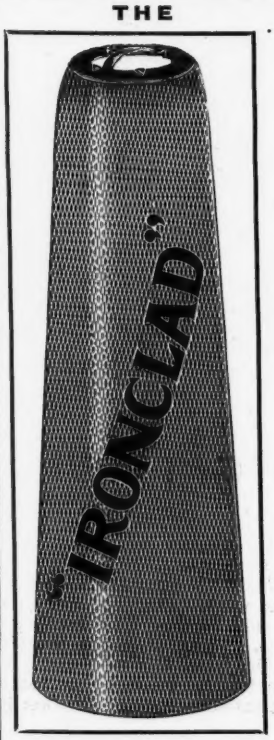

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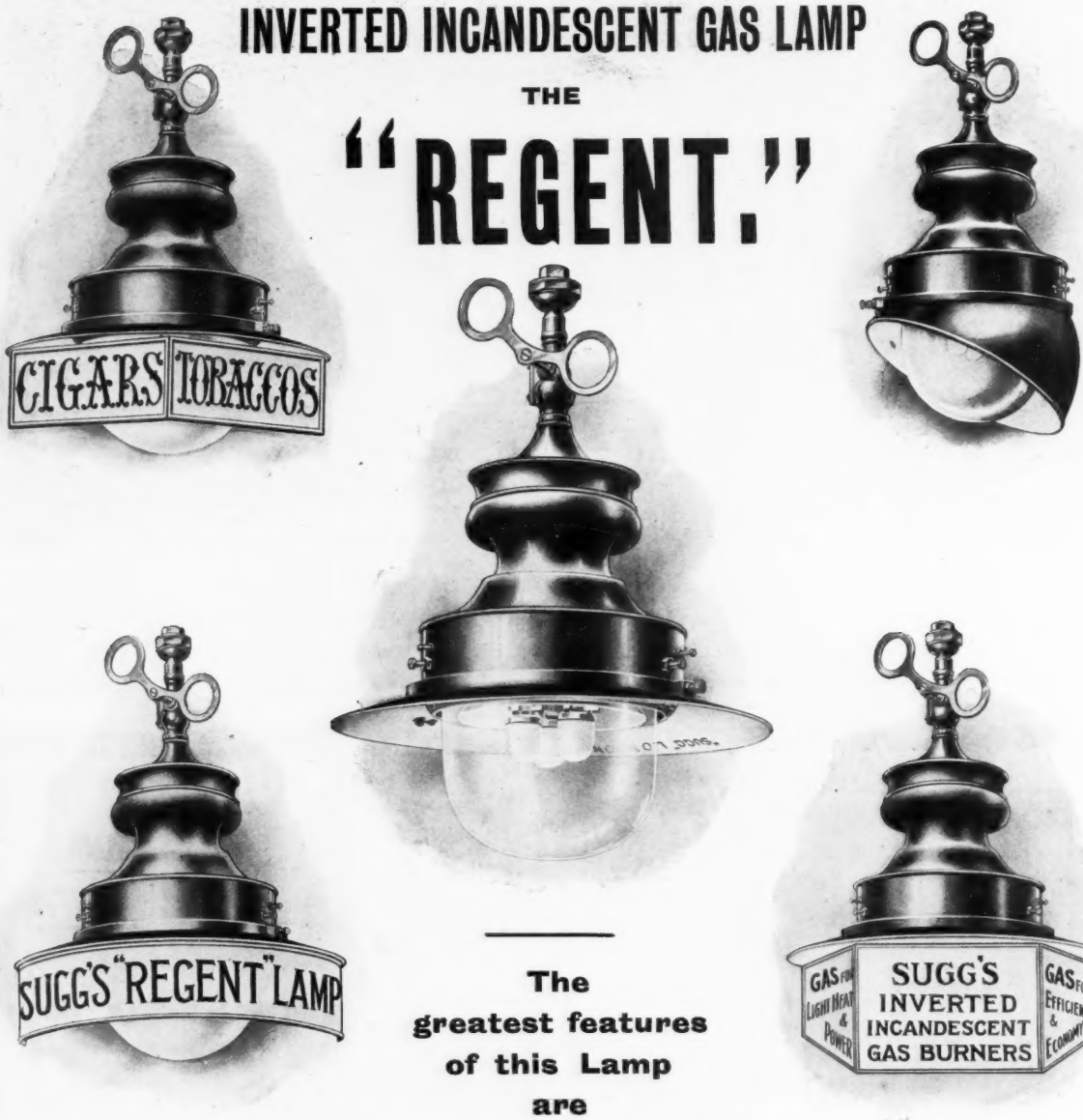
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GAS ACTS FOR 1910.

[First Article.]

The Gas Acts passed in the still unfinished session of Parliament are before us for review. To complete the history of the session, we are still waiting for the third reading of the Standard Burner Bills. The Acts that are noticed to-day are those of new Companies or Limited Companies who have now been invested with full statutory powers under Special Acts. But during the session, there has been quite a big massacre of such promotions. At the beginning of the year, there were up for review eleven promotions in this class; but five of them fell victims to circumstances—Chipping Norton, Mallow, Maltby, Tipperary, and Whitland—leaving only six Acts in the group to notice.

The first measure to be reviewed is that of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company, by which the Bishop's Stortford, the Harlow and Sawbridgeworth, and the Epping Gas Companies are to be amalgamated; and the undertakings of the Ongar, Newport (Essex) and Much Hadham Gas Companies are to be vested in the new concern. The proposed purchase of the Dunmow Gas Company has dropped out of the scheme. The amalgamated Company have also secured power to supply electricity. Information as to the capitals of the existing Companies, and the terms and conditions of amalgamation, &c., was given when noticing the Bill on Jan. 4 last (p. 23). The amalgamated Company will come into being on Jan. 1 next, with a capital of £240,000, of which £104,568 is to be the original capital, and £135,432 the additional capital. The original capital is divided into £30,800 of ordinary "A" stock, £64,368 of ordinary "B" stock, £6400 of 5 per cent. preference "C" stock, and £3000 of 4 per cent. preference "D" stock. The allocation of the original stock is set forth. As to the additional capital, this will be issued as "B" stock or new preference stock; but the total of the preference stock is not to exceed £120,000. The issue of the additional capital will be subject to the modern form of auction clauses. The dividend on the "A" and "B" stocks is to be at the rate of 5 per cent. per annum. Power is taken to create reserve and special purposes funds. In the general reference to the question of redemption funds in our editorial columns for Sept. 6, we wrote under the impression that this Company, as well as the Brighton Gas Company, had received power to create such a fund; but since the time the Bill was last under notice, the provision has disappeared. Power is taken to borrow (inclusive of £14,825 already borrowed) up to one-third of the issued capital. The number of Directors at the outset is to be nine; but no vacancy is to be filled until the number is reduced below six, and thereafter the number of Directors is not to be more than six or less than four. The first Directors are to be Messrs. L. J. W. Arkwright, A. S. Barrett, E. L. Burton, F. C. Edwards, W. J. Gee, F. H. Jones, H. E. Jones, W. W. Nicholls, and H. Sworder. Any Director of the three Companies or of the Ongar Company holding office at the date of amalgamation, and who shall not be a first Director of the new Company, is to be entitled to, as compensation for loss of office, a sum equivalent to three times the amount of remuneration paid to him as Director in respect of the year 1909. Protection is given to various local authorities in regard to road work, and to the Great Eastern Railway Company in relation to their property. The price for gas supplied to the public lamps in the district of the Hadham Rural District Council and in that of the Sawbridgeworth District Council is not to be greater than that charged to private consumers in those districts, and is to be subject to a discount of 5 per cent. For the fixing of the prices of gas, "inner" and "outer" areas are specified. In the "inner" area, the price is to be 4s.; and, under the sliding-scale, half-yearly penny variations of price will enable the increase or reduction of the dividend on the "A" stock by 1s. 9d. per cent., and on the "B" stock by 1s. 3d. The price of gas in the "outer" area is not at any time to exceed 1s. per 1000 cubic feet more than is charged in the "inner" area. But there may be differential prices as between district and district in the "outer" area; but the prices are not at any time to be less than that charged in the "inner" area. A special provision as to price relates to Ongar. Within 1½ miles of the existing Ongar gas-works, the price is not to exceed 3s. 6d., unless at any time, owing to increase in the cost of coal or other unavoidable circumstances, the auditors shall certify that it is imperative that the price charged in the "inner" area should be increased above the price charged immediately before the passing of the Act. In the Bill the prepayment meter clauses were varied by the stipulation that the charge for the hire of a meter without fittings should not exceed 15 per cent. per annum on the cost of the meter and the fixing. This has in the Act been reduced to the ordinary condition of 10 per cent. on the cost of the meter. The standard illuminating power of the gas is to be 14 candles, when tested by the "Metropolitan" No. 2 burner. The limits of electricity supply include Bishop's Stortford, Thorley, Birchanger, Great Hallingbury, Stansted-Mountfitchet, and Elsenham. In Bishop's Stortford, the electricity authorization is not to be exercised until any powers for the supply of electrical energy which may have been vested in the District Council are revoked or cease to be in force. Conditions as to the purchase by the Council, at the expiration of 21 years, or any subsequent seven years, of the portion of the electricity undertaking used solely or mainly to supply the urban district are incorporated. Separate accounts are to be kept for the gas and electricity undertakings. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Farnham Gas Company, Limited, will henceforth be known as the Farnham Gas and Electricity Company. The only variation from the particulars given when reviewing the Bill on Jan. 4 is that the standard price of gas has been altered from the proposed 3s. 9d. to 3s. 6d. per 1000 cubic feet. The standard illuminating power of the gas is fixed at 14 candles, tested by the "Metropolitan" No. 2 burner. The area for the supply of electricity is defined as the parish and urban district of Farnham and the parish of Farnham rural. It must be mentioned that the capital of the Company is to be £60,000, whereof £19,200 is the original capital, £10,000 the preference capital, and £30,800 the additional capital. Including, too, £6800 already borrowed, the Company are allowed to borrow up to one-third of the issued capital. This has to be stated, because it is provided in the Act that if within two years, or such extended period as the Board of Trade may prescribe, the Company have failed to commence to exercise the electricity powers, the additional capital is to be reduced from £30,800 to £17,000. Separate accounts are to be kept as between the gas and electricity undertakings. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

In the Garnant Gas Act, it is seen that the capital proposed in the Bill has been reduced from £18,000 to £10,000, with authority to borrow up to one-third. The power to create a reserve fund appears to have been deleted; but sanction to the formation of a special purposes fund is given. It is also provided—and this is a very general stipulation nowadays—that the carry-forward is not to exceed the amount required to pay the maximum dividend for one year. Lands are scheduled for the works. The maximum price of gas has been reduced from the proposed 5s. per 1000 cubic feet to 4s. 3d.; and the charge for public lighting is to be 20 per cent. less than that to private consumers. The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. [*Parliamentary Agents: Messrs. Baker and Co.*]

There has not been a great deal of change in the measure promoted by the Gowerton Gas Company, the provisions of which were dealt with in the "Journal" for Jan. 4 last. In the definition of the limits of supply, the proposal that they should, in addition to the main parts, include "as much of the parishes of Penderry and Cockett as is not within the existing area of supply of the Swansea Gas Company" has been expunged. The capital of the Company remains at £15,000, divided into 3000 shares of £5 each; but "809 of the said shares shall be preference shares entitled to a non-cumulative preferential dividend at the rate of 5 per cent. [not 7 per cent.] per annum out of the profits of the Company in any year, and the remainder shall be ordinary shares." There are no other changes from the particulars extracted from the Bill on the date already named, except that the old 10 and 15 per cent. discounts clause has disappeared, it being quite unnecessary with the extension by the following words of section 13 of the Gas-Works Clauses Act of 1847: "Provided also that every such contract entered into by the Company shall be alike in terms and amount under like circumstances to all consumers." The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. [*Parliamentary Agents: Messrs. Baker and Co.*]

Dealing only with the modifications of the information published on Jan. 11 from the Bill of the Havant Gas Company, it is noticed that the capital contemplated has been reduced from £23,500 to £22,000, in 4400 shares of £5 each. Of this capital, £3000 is to be "A" ordinary, £7000 "B" ordinary—the "A" and "B" forming the original capital—and £12,000 additional "C" capital, not more than half of which may be raised as preference capital. The only other changes are that the proposed standard price of gas has been reduced from 4s. 3d. to 4s. per 1000 cubic feet. A discounts clause of 10 per cent. for prompt payment and up to 20 per cent. for large consumption has been deleted; there being contentment with the liberty allowed by the addition to section 13 of the Gas-Works Clauses Act, 1847. The sundry references to electricity that appeared in the Bill as originally lodged have been removed. The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. [*Parliamentary Agents: Messrs. Baker and Co.*]

In the Wicklow Gas Company's Act, we see the proposed share capital has been reduced by £2000 to £14,100, of which £10,100 will be original capital, and £4000 [instead of £6000] additional capital. The standard price proposed for gas has been reduced from 5s. 3d. to 4s. 6d. per 1000 cubic feet. The illuminating power is to be 14 candles, tested by the "Metropolitan" No. 2 burner. Power is taken to apply for a Provisional Order for the supply of electrical energy. The other particulars noticed at the time the Bill was introduced are the same; but there has been inserted in the Act an agreement made with the District Council. *Inter alia*, it is provided by it that the prices to be charged by the Company to consumers of gas in the urban district, during the period of three years from the passing of the Act, shall not exceed 4s. 9d. per 1000 cubic feet for lighting, 4s. 5d. for cooking and heating, and 4s. 1d. for motive power. A purchase clause is included, operative in any of the next three sessions of Parliament. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

CONCILIATION IN LABOUR DISPUTES.

In last week's issue, some particulars were given from the first part of the report in connection with industrial disputes in 1909, which was lately issued by Mr. G. R. Askwith, of the Labour Department of the Board of Trade; and it was stated then that an opportunity would be taken of noticing in a similar manner the second portion of the report. The section so far dealt with related entirely to disputes which resulted in an actual stoppage of work.

The number of disputes which had resulted in a stoppage of work, but which were ultimately settled by conciliation or arbitration in 1909 was larger than in any year before. In fact, both 1908 and 1909 show a gratifying improvement in this respect on the figures which preceded them; and this increase occurred during a period when the total number of disputes was certainly not above the average. The number of workpeople involved in these settlements in 1909 was lower than in 1908—a year in which there were great disputes in the engineering, shipbuilding, and cotton trades, all of which were settled by conciliatory methods—but, at the same time, it was a great deal higher than in any of the other years in the period 1900-9. There were 436 disputes resulting in a stoppage of work which began in 1909; and 63 disputes (directly involving 79,273 workpeople, or 46 per cent. of the total directly involved in all the disputes of the year) were settled during that year by conciliation—that is to say, by the mediation of a third party or board—or else by reference to arbitration. But, of course, in some cases settlements of outstanding disputes were not arrived at until this year, while some which began in 1908 may have been settled by conciliation or arbitration in 1909. As already remarked, conciliatory methods are becoming more and more adopted as time goes on; and this is a satisfactory feature of the figures now before us—even though they deal with actual strikes and lock-outs which were ultimately put an end to in this manner, whereas with conciliation at its best stoppage of work at all should be out of the question. In 1905, 25 strikes or lock-outs were settled by conciliation or arbitration; in 1906, the figure was 46; in 1907, 45; in 1908, 56; and, as already mentioned, in 1909, 63. The number of workpeople affected, of course, varies largely in different years, and is not necessarily proportionate to the number of disputes. It is stated in the report that during the past ten years, conciliatory methods of settling disputes have been adopted more frequently in the mining and quarrying industries than in any other group of trades. Of 385 disputes (directly involving 320,893 workpeople) settled by conciliation or arbitration during the period 1900-9, no less than 116 (directly involving 112,175 workpeople) occurred in these industries. The building trades come next, with 63 disputes; then the metal, engineering, and shipbuilding trades, with 57 disputes; and after that the textile trades, with 47 disputes. Of the 63 disputes settled in 1909 by conciliation or arbitration, 35 were arranged by conciliation, and 28 by arbitration. There were 23 of them settled under the Conciliation Act of 1896; and this compares with 16 disputes so settled in 1908, and 9 in 1907. In six cases, the disputes last year terminated under the Act were settled by conciliators; and 17 by arbitrators appointed under the Act.

As pointed out, the figures given above had reference solely to those disputes in which an actual stoppage of work occurred, whether or not permanent Boards of Conciliation and Arbitration were concerned. The real object of such Boards is not to settle strikes and lock-outs, but to prevent their occurrence by timely adjustment of differences which might otherwise lead to stoppage of work. The number of permanent Boards of Conciliation and Arbitration known to have taken action in 1909 was 124; and the number of cases considered by them was 1997, compared with 1842 cases considered by 114 Boards in 1908. There was thus an increase in the number of Boards taking action last year, over that of the preceding twelve months. Of the 1997 cases referred to in 1909, 698 were settled by the Boards or their Committees, and 327 by Umpires or Arbitrators appointed by them. Of these 1025 cases, only 23 involved a stoppage of work—eleven in the coal-mining industry, one in the iron-mining industry, three in the textile trades, and the remaining eight in other branches of industry. In 777 cases, the questions in dispute were withdrawn or settled independently; in 80 instances they were referred to higher Boards; and the remaining 115 cases were still under consideration at the end of the year. As usual, the matters dealt with varied greatly in importance. On the one hand, the reduction in wages arranged by the Board for the Coal Trade of the Federated Districts affected 310,000 workpeople; while, on the other hand, the 328 cases settled by the Durham Miners' Joint Committee affected in most instances only a few employees. The greatest number of cases settled was, of course, in the mining and quarrying industries, which accounted for rather more than one-half of the total number of cases settled during the year by all the Boards. This preponderance is due to the Joint Committees for the coal trade of Northumberland and Durham, which deal solely with disputes at individual collieries, and in 1909 settled 466 out of the 564 disposed of by all the Boards and Committees in this group. The number of Boards which have settled cases in the last five years, so far as is known to the Labour Department of the Board of Trade, is as follows: 1905, 60; 1906, 78; 1907, 73; 1908, 83; and 1909, 101. Several new Conciliation Boards were formed last year; but, at the same time, one or two ceased to exist. In addition to the bodies here referred to, there are in existence certain arrangements between employers and workpeople for the settlement of disputes by conciliatory means which do not quite fall within the description of what is usually understood by Conciliation Boards—such as the schemes in the cotton, engineering, and shipbuilding trades.

ELECTRICITY SUPPLY MEMORANDA.

Epistolary Publicity—An "Attack of the Nerves"—Wanted, Men with Alert Business Brains—How the Bermondsey Council Fulfil their Obligation—The Joint Wiring Bill—The Coal Factor—Different Points of View—Municipal Domination at Canterbury.

The Electric Supply Publicity Committee are systematic, watchful, and persistent in the work of obtaining free insertion of their "advertisements" in the newspapers. They are not going to take any first refusal of insertion as final rejection on the part of an editor. Our readers know from local information and from the reference in the "Memoranda" last week that a misleading—misleading by suppression of material facts—letter on the subject of the public lighting of London (see *ante*, p. 767), signed by Mr. H. B. Renwick, the Chairman of the Electricity Publicity Committee, has been sent through the land to the daily and weekly newspapers. Some editors thought fit not to publish the letter. But its non-appearance has simply been followed by a second letter from the not-to-be-beaten Renwick, with the view of obtaining publication of the original one. One of these letters, framed for the purpose of impressing an editor with the importance of the communications of the Electricity Publicity Committee, has fallen into our hands. It is marked "Not for Publication;" but that meant by the editor to whom it was addressed. To the best of our belief, he has no intention of publishing it in his paper. But it has been handed to us as a matter of interest; and our conscience does not forbid the passing of the interest on to our readers. Mr. Renwick thus addresses the editor of the newspaper in question:

Lighting of London.

Sir,—With reference to my letter under the above heading, dated 8th inst., which I sent you for publication, I do not find that the same appeared in your last issue. In view of the wide interest and importance of the matter, and the various inquiries which have reached me, an authoritative statement appears to be looked for; and I trust that you will kindly insert same in the next issue of your valued paper.—Yours truly,

Then follows the signature of the recently much-advertised Mr. H. B. Renwick. But the editor of the "valued paper" to which he addressed this stimulating communication evidently does not regard his former *ex parte* statement as being an authoritative one; and hence the waste-paper basket. We shall be sorry if Mr. Renwick has any objection to the publication by us of the foregoing letter; but the methods and acts of the Electricity Publicity Committee are matters in which our readers take some little interest, in conjunction with the amusement they have been afforded by the obvious agitation the Committee have undergone lately through the bowling-over of electricity offers for public lighting in London by the economy and efficiency of the inverted gas-burner. The victories are not only in connection with the removal of certain arc lamps from the heart of London, but in respect of competing tenders. Just one word of counsel here. The Publicity Committee will be ill-advised to start its campaign by making themselves a nuisance to editors of newspapers, as, by so doing, they will soon lose this channel of making grievances public, of presenting their emendations of gas statements, and of trying to persuade the public that facts are deceptive things.

There seems to be a very deep-seated fear of gas men at the present time among electrical people. In addition to the awful display of fright over the public lighting question, there was in the "Memoranda" last week reference to the timidity of the Hastings electrically-influenced Board of Guardians over a proposal that Mr. Botley should have a look round the workhouse and advise as to the improvement of the gas lighting prior to a scheme for installing the electric light being obtained from the Corporation Electricity Committee. And now attention is transferred to Watford. There the Council have received from the Local Government Board a letter sanctioning certain electric lighting loans; and in the letter there were some strictures concerning the public lighting, and a suggestion that the Council should look further into the question of using gas in the streets. There was a request, at the last meeting of the Council, that the letter should be read, so that the ratepayers might be informed as to what the Board had to say on the subject of the management of the public lighting department, and for the ratepayers' guidance in future. The Chairman of the Electricity Committee raised an objection to the letter being made public; and the act may be taken to mean that there was truth in what the Local Government Board said, and that the Electricity Committee had nothing to say in defence. Otherwise, why the reticence and display of pusillanimity? Possibly, the large ratepayers can find another way of obtaining knowledge respecting the contents of the letter over which the Electricity Committee are so obstinately secretive.

The electrical engineering correspondent of "The Times" has

been giving his professional readers something about which to think. He does not believe in the old cry of overcrowding in the electrical profession. Those hundreds of young fellows who are elbowing each other about in the hope of getting a job at a salary that will perhaps keep body and soul together if expended with a due sense of the necessity for a cast-iron economy, will wonder whether that engineering correspondent has ever occupied their own precarious and penurious position, and, if so, whether the more comfortable conditions of the present have blotted the period from memory. On the other hand, those who have a position, lucrative or otherwise, in the electrical profession will indulge in a little introspection to ascertain whether this particular shaft of the "Engineering Correspondent" is directed to them: "It is," he writes, "the curious fate of the new professions to prove specially attractive to incompetents." So it is his view that there is a great deal of sifting out to be done in the professional ranks of the electrical industry, in order to get rid of the incompetents. But what is to be done with these electrical incompetents. The gas industry has no use for them; the Church has all too long borne the stigma of affording a haven for dullheads; the entrances to the chambers in the Temple have no space left for the writing up of new names; there is big competition in other professions; and there are already too many electrical journals, and they are fully staffed. The only idea that occurs to us by way of suggestion for the incompetents that have been attracted to the electrical profession is that positions might be found for them as tram fare collectors on the electrical tramways. This would not be such a drastic severance as complete dismissal from electrical service. What the electricity supply industry wants according to "Engineering Correspondent" is a better selection of recruits, and the encouraging of the brighter intelligences. This appears to be sound advice; and apparently it is, accepting our friend as having a personal intimate knowledge of his subject, very necessary advice. His indirect abuse of the existing electrical professionals must be to them intolerable. "The industry," it is written, "is positively hungry for the services of men of alert business brains and of technical fertility." If the industry is so hungry, then there must be few in it at the present time with the qualities he describes. What has he to offer the men of bright intelligences, alert business brains, and technical fertility who are so sadly required? It appears to lie only in the future. "The prospect of the commercial development of electricity is boundless." Well, so it has been (in print) since the early eighties; and many men who thought that they had bright intelligences, alert business brains, and technical fertility, and who were then attracted to the profession believing in its boundlessness, have since departed, little richer than when they entered the profession, to their final rest. But the point is that the industry is to-day positively hungry for such men; and there are men who are hungry because the industry cannot find positions for them.

Is there anyone looking after the Bermondsey Borough Council, to see that their legal obligations in connection with the electricity undertaking are complied with? In 1902, at the instance of the South Metropolitan Gas Company, there was inserted in the Bermondsey and Woolwich Electricity Orders a clause, in which the following appeared: "The undertakers shall once in every year . . . cause to be laid before them a statement and balance-sheet . . . and thereupon fix annually the charges to be made for the supply of energy in the then ensuing year, at such rates (not exceeding the maximum rates specified in this Order), so that, as far as is reasonably practicable, the revenue for that year shall not be less than the expenditure for that year." Deficits in connection with the Bermondsey undertaking appear to be the chronic state. For instance, in 1908-9, the deficit was £2645; and in 1909-10, it was £1277. This is not complying with the decree of Parliament; nor do we think the deficits represent what is "reasonably practicable" in regard to revenue being at least equal to expenditure.

The Incorporated Municipal Electrical Association, we are asked to believe, are well satisfied with the measure of support they are receiving for the joint Bill to be promoted next session for wiring and fittings powers, to invest the promoters with a stand-by clause, and to give additional protection against unauthorized competition. Up to the last information to hand, 82 replies had been received to their circular of inquiry; but only about half (or, to be exact, 42) have promised financial support. Twenty are so sympathetic with the proposal that they are prepared to open their hearts to an extent sufficient to let out a little moral support for the Bill; and a further five merely express themselves in favour of the proposal. Twelve of the responding authorities will take no action. One of the remaining three will consider the matter again; the second will support the Bill in regard to the stand-by and unauthorized competition clauses, but not wiring and fittings; and the third authority are indifferent, being already in possession of the powers. "Moral support" and friendly expressions in favour will not go far towards providing the "sinews of war." A joint Bill costs money, particularly when a number of people are interested in projecting themselves across the path of the measure, as will be the case in this instance.

An interesting article has appeared in the "Electrical Review" on the subject of coal supplies to electricity stations. The writer points out what a sensitive factor coal—representing about one-third of the total working expenses—is in the making or marring of the financial issues of a concern. "Upon the price of coal almost hangs the life or death of a station." It is clear that, in those stations where the power load, with its low prices, has attained to considerable proportions, any serious rise in the price of coal would have a disastrous effect—more so than when the power business only formed a very small proportion of the whole, and before the consumption for private lighting began to recede through the metallic filament lamps. The writer of the article in question does not favour sitting quietly waiting for the trouble to come; but he looks round to see what electricity supply undertakings can do in the way of fortifying themselves against the evil days of high-priced coal. In his view, something could be done in saving expense by joint purchase and conveyance of coal by undertakings whose stations can be served by water carriage. He thinks that "gas folk" would not be above supplying electric undertakings with information on the subject of the conveyance of coal by their own steamers. The writer, we fancy, is referring more particularly to the London Gas Companies, who, however, bring the coal they require from the North and not from Wales. He refers also to what is being done by one company (to whom it would not be difficult to affix a name) in these words: "About four years ago a certain gas company, whose works are not an hour's row from Putney Bridge, purchased a second-hand steamship, and worked her regularly for many months, bringing coal from the Tyne and Hartlepool neighbourhood down the coast and up river under many bridges to alongside their works in London. Orders were placed with the collieries direct. The trial proved so successful, even after taking into account the cost of the unloading gear, that a new ship was ordered and built to the particular requirements of the work. Being a much faster vessel than the old one, supplies quickly became too plentiful, and but little difficulty was experienced in finding other people willing to hire the ship for similar purposes. The enterprise paid better than was anticipated. Therefore what is to stop others from going and doing likewise?" Nothing, if all the conditions are similar. It is, however, very interesting to find that the electrical industry are still willing to take hints from its old and successful "enemy."

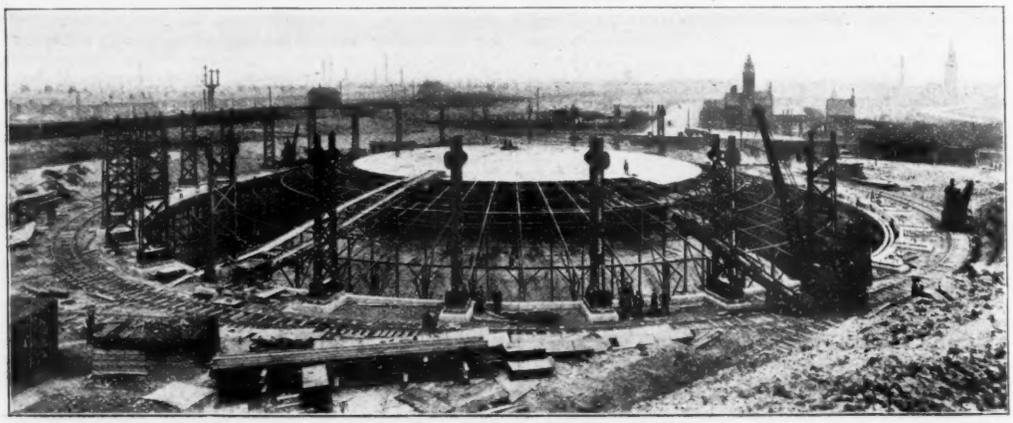
Only the other day, the "Chemical Trade Journal" was upbraiding us for something or other we seem to have been saying about Professor Armstrong; and the blow was severely felt when our contemporary said: "If only one-fifth of the scientific knowledge that has been applied to the electrical industry had been applied in the gas industry, the latter would have been in a position to defy competition from any source from the illuminating and heating point of view." It is rather confusing to read this, and then the statement of the Engineering Correspondent of "The Times" as to the requirement of more brains and technical fertility [see a previous paragraph] in the electrical industry, and finally to have the writer on coal expressing the willingness of the electrical industry to take advantage of the experiences obtained from the gas industry's enterprise. Someone must be wrong; and in view of the financial condition of the gas industry, we rather think it is the "Chemical Trade Journal."

Another instance of the complete domination of a Board of Guardians by a Municipal Electricity Committee comes from Canterbury; and we place it in conjunction with the Hastings case dealt with last week. The lighting of the workhouse and infirmary is in question; and there seems to have been a great deal of indecent haste on the part of the Guardians in running through a scheme in favour of the Electricity Committee. At any rate, there has been no adequate consideration of the most modern form of gas lighting, which could be introduced at an initial expenditure comparatively small against the cost of introducing electric lighting. But the Guardians have fallen into the convenient error of contrasting what has been in gas lighting, with what is in electric lighting, according to the *ipse dixit* assertions of the Corporation Electrical Engineer. They have had no real guidance on the question; and though Mr. H. G. Page, the Engineer of the Gas Company, wrote to the Guardians putting a different complexion on the statements of the Electrical Engineer, the Guardians have treated the letter slightingly. They want no inconvenient correspondence, nor do they desire to wait till the inaccuracy of the Electrical Engineer's statements as to comparative costs is proved. All they propose doing with Mr. Page's letter is to acknowledge it; and as to the practical challenge to the Electricity Committee by the Gas Company's Directors, through their Secretary, Mr. James Burch, as mentioned last week (p. 798), the Guardians brush that aside as being no concern of theirs. In other words, the Guardians by their action declare that a question of economy is not a matter about which they need trouble themselves. This is a new principle in regulating the conduct of the public interests by such bodies, and not a principle that is to their credit. The challenge of the Gas Company has not yet been taken up by the Electricity Committee; the assigned reason being that there was no meeting of the members of the Committee during August. We observe, however, that the Electrical Engineer has returned thanks to the Guardians for the considerate treatment of his department, and says that he is now making arrangements for the laying of the necessary cables to the workhouse. He does not mean to lose any time in getting a supply of electricity to the premises, with the Gas Company so anxious to disprove his assertions. But who has given the Electrical Engineer power to proceed with his arrangements to lay cables involving capital expenditure if there has not been a meeting of the Electricity Committee since the challenge of the Gas Company was issued?

NEW TANK AND GASHOLDER AT MANCHESTER.

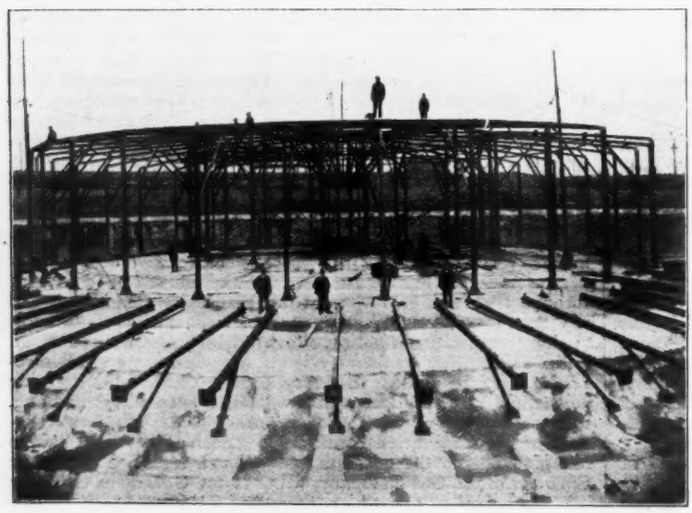
Inspection by the City Council.

At the invitation of the Gas Committee of the Manchester Corporation, about ninety members of the City Council made last Wednesday afternoon an inspection of the new gasholder and tank now in course of construction at the Bradford Road station. The party, which included the Lord Mayor (Councillor Charles Behrens), Miss Ashton (a lady member of the City Council), and Alderman Gibson, the Chairman of the Gas Committee, spent some hours in viewing the works under the guidance of the Gas Engineer (Mr. J. G. Newbigging, M.Inst.C.E.) and his assistants. The more energetic members of the Council climbed to the top of the new structure, and in this way gained a better idea of the huge undertaking. In a paper read before the Manchester District Institution of Gas Engineers on Feb. 27, 1909, and published in the "JOURNAL" for March 2 (p. 618), Mr. Newbigging gave full details of the new tank; and particulars of the holder itself were given in an earlier issue—viz., on Jan. 12, 1909 (p. 102).



The Latest Photograph of the Holder.

For the information of the members of the City Council taking part in the proceedings, a pamphlet, bearing the title of "Memoranda *re* the New Tank and Holder," had been prepared by the officials of the Gas Department, under the direction of the Engineer. This set forth that the Bradford Road gas-station covers an area of 52 acres and 3856 square yards; that the foundation stone of the works was laid by the late Alderman Hopkinson on Oct. 10, 1877, the land having been acquired in 1870 for gas first manufactured on Dec. 16, 1884; that the present capacities of the works are 8 million cubic feet of coal gas per 24 hours and 6½ million cubic feet of carburetted water gas, with a total storage capacity of 13·8 million cubic feet; and that the value of the land, buildings, apparatus, and gasholders was £857,366. The following particulars were furnished as to the new tank and holder.



The Tank and Holder as they Appeared last April.

TANK.

Size of tank, 285 feet in diameter and 43 feet deep. Excavation for tank walls, &c., 107,000 cubic yards. Clay puddle, 7940 cubic yards; cement concrete, 5660 cubic yards. Number of bricks required for tank, 4 millions. Thickness of tank wall, 5 ft. 6 in. at base, and 2 ft. 9 in. at the top. Stonework, 10,225 cubic feet. Timber used in the excavation to keep the ground intact until the walls are built—polling boards 89,500 superficial feet and 1½ inches thick, walling timbers 14 660 cubic feet, struts 18,330 cubic feet, punchings 3000 cubic feet. Total depth of excavation in the trench, 50 feet; ditto in the pipe recess, 56 ft. 9 in. Total weight of steel and ironwork in tank framing, 258 tons. Water required to fill the tank, 9,042,018 gallons, or 40,366 tons. Cost of tank, £35,638.

GASHOLDER—FOUR-LIFT.

Total capacity of holder, 10,410,000 cubic feet. Ground level to top of holder crown, 182 feet when filled. Ground level to top of guide-framing standards, 169 ft. 6 in. The steel standards and guides are 32 in number, each weighing 30 tons complete. Floating weight of the holder, 1607 tons. Total weight of steel and iron work in the holder complete, 3080 tons, excluding tank-framing previously given. Estimated cost of the holder with tank-framing and inlet and outlet pipes, £52,600.

The holder will be the third largest in the world—that at East Greenwich having a capacity of 12½ million cubic feet, and the New York gasholder one of 15 millions. In the East Greenwich holder, however, the guide-framing is carried to the height of the third lift only; so that the Manchester structure, while being not quite the largest in the world, is probably the heaviest of its kind. The whole of the work has been designed by Mr. Newbigging. The Contractors for the holder are Messrs. Ashmore,

Benson, Pease, and Co., Limited, of Stockton-on-Tees; the contract for the tank being let to a local contractor.

Hospitality of the Gas Committee—A Novel Suggestion by the Gas Engineer.

At the conclusion of the inspection, the party drove to the Town Hall, and were entertained at dinner by the Gas Committee. The company included the Lord Mayor, Alderman Gibson, Mr. Newbigging, Mr. A. Price (Superintendent of the Gas Department), Mr. Charles Nickson (Consulting Superintendent), and Mr. T. Vosper (Chief Clerk). A short toast list was gone through.

Alderman GIBSON, in the course of his speech in responding for the Gas Committee, presented some interesting particulars in regard to the development of the gas undertaking of the Corporation, and showed how the need had arisen for the construction of the new tank and holder at the Bradford Road works. He mentioned incidentally, on the question of cost, that the first holder put up for the Corporation averaged £21 per 1000 cubic feet of gas; while the present one would only average £8 10s. per 1000 feet. As to the need of greater storage capacity, he told the company how some five years ago the gas supply nearly gave out. It was about Christmas time, and so foggy that gas was being consumed practically all through the day and night for nearly a week. As they had no capacity for storing more than an average day's consumption, the Gas Department was, so to speak, working from hand to mouth; gas being used as fast as it could be made, and there being no reserve. Alderman Gibson added that during the whole of his seventeen years' chairmanship of the Gas Committee they had never had sufficient storage capacity; but with the new holder in use in the winter of 1911 they would be in a position to meet without trouble any abnormal demand.

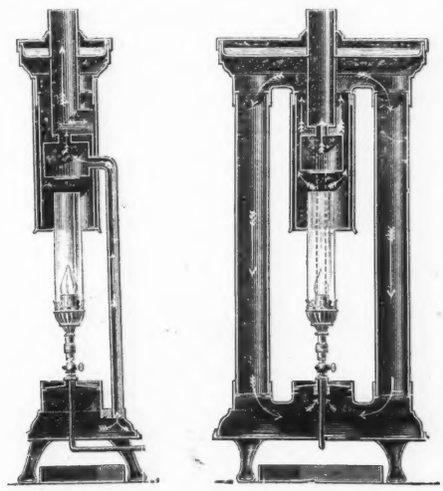
Mr. J. H. THEWLIS, in proposing the toast of "The Engineer," spoke in flattering terms of the ability of Mr. Newbigging, who had, he said, secured for himself a high and well-deserved reputation in the gas profession, as had his father, whose advice was still in request as a consulting engineer. By his knowledge and experience, the Engineer to the Gas Department had, in the construction of the new tank and holder, relieved the Council from having to call in an expert; and he had, as a consequence, saved the city a very considerable sum by carrying out the work himself. It was a matter of great satisfaction to the Corporation to know they had so valuable a servant, under whose guidance the work in connection with the new tank and holder had been carried out. Not only did Mr. Newbigging see to the getting out of the designs and specifications, but he superintended the operations from the start to the present advanced state of construction.

Mr. NEWBIGGING, on rising to respond, was received with applause, which was continued for some time. In the first place, he thanked Mr. Thewlis for the way in which he had proposed the toast, and for the kind reference made with regard to himself. He said he did not overlook the fact that much of the success he might have attained in supervising the technical work of the Gas Department in Manchester was due to the encouragement he had received from the Chairman of the Gas Committee, and to the thoroughness with which Alderman Gibson had entered into any schemes submitted to him for improving the work of the Department. He was also fortunate in having as his colleagues a thoroughly capable technical staff, whose assistance in the carrying out of such work as the visitors had just seen had been invaluable, and whose earnest desire, equally with his own, was that the gas undertaking should be brought to the highest state of efficiency, and be worked in the best interests of the consumers. It was a happy thought of Alderman Gibson to invite the members of the City Council to inspect the work they had in progress at Bradford Road in the construction of the 10 million cubic feet gasholder—particularly at this time, when it was in its most interesting stage of construction. Having seen it for themselves, and been supplied with a considerable amount of information with regard to the structure, it was unnecessary for him to take up their time by going into further details. He might say, however, that the Contractors selected by the Committee to construct the tank and holder were firms of the highest reputation in this class of work, and had carried out their contracts thoroughly and well. In twelve months' time, the whole of the structure would be completed and available for use. The Gas Department would then reap the economical and other advantages which adequate storage capacity would give; and he was sure they would all wish with him that the Chairman might be there to inaugurate the holder to the public use. Proceeding, Mr. Newbigging said: I should like, with your permission, in a few words, to take this opportunity—an opportunity which rarely presents itself, of an official being able to speak to his City Council—to impress upon you the advantages which accrue to such cities as Manchester in giving a cheap supply of heat and power in the shape of gas and electricity, in order that solid fuel can be displaced to the greatest possible extent. It is estimated that about 750,000 tons of solid fuel—mainly bituminous coal—are used annually in domestic fires in Manchester; and if this could be reduced even to the extent of one-half, it is difficult to properly realize what an effect it would have in improving the atmospheric conditions of the city, and the lessening of damage to the health and property of its inhabitants. It is useless to adorn the city with costly and beautiful buildings in the shape of Art Galleries and the like, without first attempting to make provision to save them from disfigurement and destruction by reducing the output of smoke, with its attendant evils; and the city has in its possession two departments—gas and electricity—which can effect the only practical remedy for the smoke nuisance. This desirable state of affairs can only come within reasonable expectation of being realized by removing every obstacle in the way of distributing cheaper supplies of gas and electricity. I venture to say that one of the best pieces of work carried out by the Chairman during his tenure of office was the abolition in 1903 of the charge for the hire of cooking-stoves—costly as this has been to the Gas Department in loss of revenue—when there were only 12,803 in use; the advantage being shown by the fact that there are now upwards of 50,000. At a low estimate, these 50,000 cooking-stoves have displaced 50,000 tons of coal per annum in domestic fires. At least an equal quantity of coal could be displaced, if somewhat similar facilities were given for the use of gas-fires for heating; and I trust the City Council will see their way to reverse their decision of a few months ago. When it is remembered that only about 20 per cent. of the total quantity of gas manufactured in Manchester is used for purposes other than illumination, it can be seen what a field there is for development in this direction. I am sanguine enough to believe that it is within the range of "practical politics" that future generations will realize that, instead of such departments as gas and electricity being rate-aiding, it will be more profitable to have them rate-aided, as the savings which would be effected in preserving the health and property of the inhabitants of large cities, by supplying gas and electricity at low prices, will far outweigh the sums contributed by them in aid of the rates. The Corporation of Glasgow are taking a strong lead in the direction of cheapening their gas and electricity supplies, and educating the people in their efficient and economical use, in order that the smoke evil may be effectually dealt with; and I trust Manchester will not rest satisfied to take second place in such a campaign.

CLARK'S SYPHON STOVES.

A New Greenhouse Heater.

THERE is on view in the new show-rooms of the Clark's Syphon Stove Company, Limited, at No. 132, Queen Victoria Street, E.C., a very attractive array of improved patterns of the well-known "Syphon" and other heating stoves, which will repay careful inspection. The name of the firm's specialities has, of course, long been familiar; but, nevertheless, there are two or three points about the stoves which, to the average lay mind, require some explanation, in order to be fully understood.



The Action of the Syphon Stove.

As shown, the hot gases, after leaving the burner, first of all strike the central heating chamber, pass over the shoulders and down the side columns, and are condensed, as in ordinary condensing stoves. Then, as illustrated above, the hot air is drawn from the condensing chamber by a vacuum caused by the heating of the central heating chamber, up the tube at the back of the stove, where it is re-burned or re-heated and allowed to mix with the superheated air, before being sent out into the room.

The "Corinthian."

The "Czarina."

Special attention may be drawn to the fact that these "Syphon" stoves are claimed to give out pure heat only; and they can be employed for the heating of any building or room. In fact, many

are now used for heating aviaries and greenhouses. When employed in the latter, a moist heat can be obtained by putting water in the top of the stove in the space provided for it. The Company manufacture several patterns of stove on this "Syphon" principle, and to suit the varied requirements of home, office, or workshop. Among others, there are the "Czarina" and the "Reflex," which are exceptionally powerful heaters; while the "Corinthian" and "Princess" are of decidedly artistic appearance. Since the Company was formed, special attention has been devoted to the matter of finishes; and a strong feature is now being made of the new bronze copper finish. This is a very pleasing and soft tint, and is excellent for decorative purposes. All the "Syphon" condensing stoves made by the Company are now fitted with patent and efficient governors, which automatically regulate the flame to suit the varying local pressures.

In the "Motex" garage and greenhouse heater, the Company have an appliance which promises to have a big future. A decided point is that the heater can be fitted inside the house. There is no danger of petrol fumes coming into contact with the flame of the heater, or of any of the products of combustion entering the room so as to injure plant life. The air is drawn in by means of flues through the combustion chamber, and the waste products carried out in a similar manner. There is a central flue, round which the atmospheric burner is fitted inside. This being quickly heated, it draws its requisite supply of air from the room and passes it through the stove. The water-chamber is made of strong copper, and is constructed to secure the best possible results from the gas consumed. It is arranged with an outer and with cross sectional chambers; and it contains only a small quantity of water, which permits of quick circulation with a small gas consumption. The "Motex" is made in two sizes, and is very compact. No. 1000 (14 inches diameter) will heat 40 feet of 3-inch or 60 feet of 2-inch piping, while No. 1001 (16½ inches diameter) will heat 60 feet of 3-inch or 80 feet of 2-inch piping.

The good name which Clark's stoves have always had should be enhanced by the improvements that have been introduced. The new management are tackling the business in a practical and energetic manner, which should ensure a big demand for their manufactures.

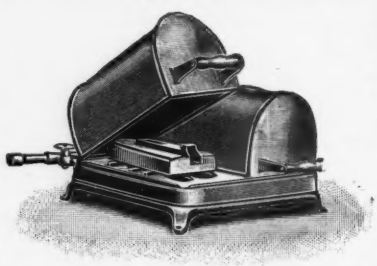
THE "PACO-HENNIGER" GAS IRONING STOVES.

In many trades which need not be enumerated here, the use of a hot iron plays an important part; and therefore the question of the best and most economical method of heating this appliance is one that is worthy of careful consideration. Some ways may be inefficient, and some wasteful; but the features of the "Paco-Henniger" ironing stoves, in which gas is the heating agent employed, would seem to show that neither of these disadvantages will be found to attach to them. In fact, it is claimed for the system that it has been designed with the primary objects of reducing the consumption of gas to the lowest possible limit, and of supplying the worker at any time, according to the work at which he or she is employed, with irons ready for use and at the right temperature. The one, it is claimed, has been achieved by making the utmost possible use of the calorific value of gas, and the other by having paid due regard to every possible requirement peculiar to, and distinctive of, those trades where the handling of irons is part and parcel of the business. The "Paco-Henniger" ironing stove, though only now being introduced in this country, is not by any means an untried idea, for there are already over 4000 of the appliances used daily abroad; and an inspection and explanation of the apparatus in the show-room of the Agents—the Patent Appliances Company—at Nos. 15-17, City Road, E.C., convinces one that it is deserving of thorough investigation by those whose operations call for the aid of hot irons.

The stoves are of various sizes, and differently arranged to suit the needs of particular businesses. Taking the first illustration, which shows a single-burner stove, it may be remarked that the bunsen burner under the iron is, while heating is in progress, shut in by the cover, which is heavily insulated; and by means of baffle and guide-plates, the heat in the chamber thus formed is forced to circulate round the iron several times before the products of combustion pass out of the opening in the top of the cover. The object of this is to thoroughly heat the iron from all four sides, instead of only from the bottom, as with open burners or hot-plates. Underneath the burner there are fitted a baffle and a guide-plate, the intention of which is to serve the twofold purpose of shutting off the heating chamber and causing the primary air to be drawn in laterally and thus become preheated, so as to still further increase the power of the burner. The burner has a bye-pass; and in the smaller types of stoves, the extinguishing and re-lighting of the bunsen burner is performed automatically. That is to say, the hinged cover is connected with the burner-tap in such a way that, when the cover is lifted for the insertion or withdrawal of an iron, the main supply of gas is automatically turned off, and only the bye-pass is left burning. Upon the lid being closed down again, the supply of gas is similarly turned on, and the burner is relighted. Thus there is no waste of gas. The small iron heaters shown are arranged for standing on a bench or table; but it may be pointed out that they can, if desired, be had fitted on convenient stands.

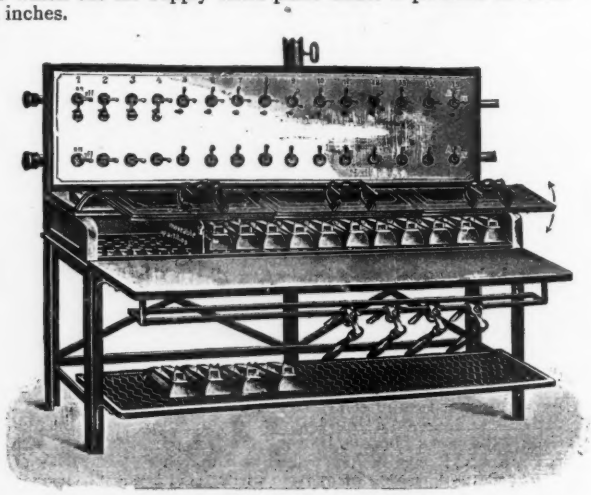
"Paco-Henniger" Single-Burner Ironing Stove.

The above explanation of the principle on which the apparatus is constructed applies, of course, to the large as well as the small sizes. In the case of the former, however (all of which have stands), each burner and bye-pass is capable of separate and independent manipulation and adjustment from a switch or controlling board, which is provided in the manner depicted in the third illustration. In the three-burner size and upwards, too, the heating of all irons can be accomplished in one large, common chamber, which has the advantage that, when the irons have been heated, some of the burners can be turned down, leaving just sufficient—say, one burner—to keep the irons hot with the lid of the apparatus closed. As each burner can be regulated separately, it is possible to have the various irons at different temperatures; and this, we learn, is an important consideration in connection with the tailoring and clothiers' trades, the work of which does not under all circumstances demand irons of one temperature.



"Paco-Henniger" Stove with Two Burners.

Another feature of these large stoves is an arrangement by which, when desired, the heating-chamber can be subdivided into separate compartments, by means of movable partitions, which are also insulated with asbestos. This further facilitates the heating of the irons to different temperatures; while, of course, if only one iron is needed, the subdivision of the chamber enables this to be quickly done with one burner only alight. With the large stoves, it may be added, the irons are heated in one or two tiers, according to the use for which they are required. One form of three-burner stove will heat six irons (in two rows), and will then keep them ready for use with the aid of the centre burner only, while the largest size of tailor's stoves has nine burners, and is fully capable of taking in the two rows from eighteen to twenty irons, according to their bulk; and when forty irons are available, this permits the continuous use of twenty, because as soon as one is withdrawn another can, of course, be put in its place. With the single-burner stove, as a matter of fact, it is guaranteed that, with a properly adjusted gas supply, and by employing three irons for interchanging, a continuous supply of hot irons can be provided for the simultaneous use of two workers, owing to the short time that is required for heating. Laundries and hat-makers, who must have as hot an iron as possible, and uniform temperature, are supplied with stoves in which the irons for heating are placed in one row; the largest stove having fifteen burners, to which the air supply takes place under a pressure of about 4 inches.



A Large "Paco-Henniger" Stove.

The iron itself is also the subject of a patent, the point of which is a detachable handle having an eccentric locking device. The handle has a tongue which is slipped into the iron; and then with one half-turn, an eccentric thumb-screw at the back engages with a catch on the iron, and thus grips the iron firmly. The rigidity of this grip is not lessened by wear, as both the eccentric screw on the handle and the catch on the iron are conically shaped. One handle fits all sizes of the "Paco-Henniger" irons; and it is, of course, not necessary to have a separate handle for each iron. Fixing and detaching is the work of a moment; and the handle is always cool, as it does not remain in the stove with the iron.

Among the advantages claimed for the system is that the complete combustion of the gas enables irons to be heated in a remarkably short time, which means an economy of gas, in addition to that which is secured by the bye-pass regulation of the burners. This complete combustion, too, is an obvious advantage from a hygienic point of view. Then, flexible tubing can be dispensed with. In large laundries it will probably be found more satisfactory for each girl to have a one-burner stove in front of her; but in many circumstances one large stove would likely be preferred. The bigger patterns are provided with flues. The appliances are of most substantial make, and can be confidently relied upon to enjoy a long life.

To the tailoring trade, the "Paco-Henniger" stoves should certainly appeal strongly; and they should also play an important part in connection with laundries, hatters', and other businesses. Thus there is a large field open to them, the filling of which, while proving satisfactory to both sellers and buyers, will also be a gain to the suppliers of gas. It is, of course, because of the latter consideration that we welcome the invention—as we do everything that is likely to popularize the use of gas—and bring it to the notice of our readers.

THE "RAMASSOT" GAS-BOILER.

Among the varied assortment of exhibits in the engineering line which are now to be seen at Olympia, is a new gas-heated boiler for central heating by means of hot-water radiators, which is being placed on the market by Messrs. J. Marse and Co., of Imperial Buildings, Ludgate Circus, E.C. This has been named the "Ramassot" low-consumption gas-boiler; and as it is in action on the firm's stand, visitors to the Exhibition are afforded an opportunity of judging for themselves as to its water-heating efficiency. Usually, the appliance would be located in some such position as a hall; and its elegant appearance renders it suitable for any prominent place. The finish is, of course, a matter of taste. It can be painted, enamelled, or covered with glazed tiles; and a marble top adds to its attractiveness.

The "Ramassot" Gas-Boiler.

Appearance, however, though often, as here, an important factor, is not by any means the principal point in connection with gas-heated appliances, whatever may be their nature. We have first to look at their capacity for performing what is required of them. Judged also from this stand-point, however, the "Ramassot" boiler should not be found wanting; for the latest official trials, which were made as severe as possible, and were carried out by a Committee of the French Association of Boiler-Owners, showed an efficiency varying between 82 and 93 per cent., while, in addition to this, the apparatus was a few months ago granted the highest award by the Société Technique de l'Industrie du Gaz en France. The facts being so, it is not to be wondered at that the boiler is regarded by all interested in it with the utmost degree of confidence. The one at Olympia is fitted with three burners; and a few evenings ago this was seen (by means of a thermometer fixed on the outlet-pipe) to raise the temperature of the water in it from 66° to 190° Fahr. in ten minutes.

At present the boiler is made in five sizes, capable of supplying radiators having a heating surface of 65 to 430 square feet; but as it is made up in sections, the size merely depends upon the number of the sections, or the elements, employed. The height in all cases remains the same; and the elements are interchangeable. The elements are connected together by means of screwed nipples; and the water inlet and outlet are arranged at the side of the apparatus. There is a flue to carry away the products of combustion; and a collector is provided for drawing away the water of condensation. The sections are all made of the best selected cast iron; and the centre of each is formed of a copper tube, which is expanded in position in such a manner as to prevent any possibility of leakage. Provision is made in this tube for expansion and contraction with varying temperatures. Each section has its own burner, which is of the firm's well-known "Visso" double bunsen type. Small jets, or pilot-lights, are also fitted; and these are first of all lit, and, when the main gas supply is turned on, they ignite the large burners. The small jets are then at once extinguished. The efficiency of the boiler is claimed by the firm to be due, in the first place, to the burner employed. Furthermore, they add that the action of the elements is based upon a well-known principle applied in a new form: (1) The central part of each element being formed by a copper tube, and serving as a chimney to the burner, it practically heats the water instantaneously; (2) the ribs of each element are so cast that, when all are bolted together, the hot gases completely surround the channels containing the water; and (3) the flames and hot gases return to the bottom of the boiler before passing into the atmosphere—their direction being contrary to the flow of the water. The water enters at the bottom of the boiler; passes up one side, and down the other; and then enters the annular space round the central copper tube. Up to this point, the water has been slightly heated by its contact with surfaces heated by the waste gases; but on reaching the hot copper tube, it becomes suddenly heated, and rises rapidly to the top of the annular space, drawing more water behind, and thus causing a quick circulation through the whole system.

A feature of the apparatus is the patent brass regulator, in which a mixture of glycerine and water acts on a rubber diaphragm attached to a piston. This piston (actuated by the influence of the temperature on the sensitive mixture referred to), according to its upward or downward movement, opens or shuts the gas supply. A second piston, fitted above the first one, is operated by hand, and can be set so as to determine the exact point of closing the gas-inlet. In this way, any desired temperature can be retained. The regulator prevents the water rising above a temperature of 203° Fahr.; and a bye-pass is fitted, so that in no case will the gas be entirely shut off from the burners. The consumption of each burner can be varied between 35 cubic feet and 5 cubic feet per hour; and when once a three-burner boiler has been raised to the desired temperature, it will keep hot 216 square feet of radiators with a consumption of about 15 cubic feet of gas per hour. Each burner is under separate control, so that one or more may be used, as required. With all the burners full on, the hand can be comfortably placed over the flue through which the combustion products pass; so that the loss of heat is slight. All parts of the boiler, it may be pointed out, are easy of access.

Though naturally the gas consumption varies according to the amount of heat required, it is claimed in all cases to be considerably less than that of any other gas heating arrangement. In conclusion, it may be remarked that the apparatus will work with any pressure of gas from 5-10ths upwards.

IMPROVED WATER SUPPLY FOR PORTSMOUTH.

New Covered Service Reservoirs, Filter-Beds, &c., at Farlington.

By invitation of the Directors of the Portsmouth Water Company, a large party, including a number of ladies, visited the new storage and filtration works which have been carried out by the Company at Farlington, on Portsdown Hill, to the plans and under the supervision of their Engineer, Mr. Herbert Ashley, M.Inst.C.E. Among those present were the Chairman (Mr. W. Grant, J.P.), the Deputy-Chairman (Colonel C. Lanyon Owen, J.P.), other members of the Board, the Secretary (Mr. J. L. Wilkinson), the Engineer, the Mayor of Portsmouth (Sir W. T. Dupree), and the Town Clerk (Mr. G. Hammond Etherton); also some of the shareholders of the Company, and members of the Portsmouth Town Council and of the Urban and Rural District Councils outside the borough coming within the Company's statutory area.

On arriving at the site, the party were conducted into one of the reservoirs and welcomed by Colonel Lanyon Owen. Mr. Ashley then furnished the following particulars in regard to the works, which cover 12 acres of ground.

The Filtration Works.

The selection of Portsdown Hill as the site of the filter-beds carries with it, among other advantages, a very important one which makes this installation perhaps unique among filtration works in this country. Usually the water is filtered at a low level somewhere near the source, and pumped into high-level service reservoirs for distribution; but in the present case the pumping is done before filtration—the water being delivered by the pumps straight on to the filter-beds, from which it gravitates direct to service reservoirs, and thence to the Company's district. Consequently, it is never exposed to daylight from the moment of filtration until it issues from the consumers' taps. The pumping of the water prior to filtration is a great advantage. The works are constructed on the side of the hill, which slopes gently from north to south; the northern part of the filter-beds being cut into,

and founded on, the solid chalk, while the southern half is carried by means of concrete arches on brick walls over the northern portion of the new reservoirs, thus forming part of their roof.

The filter-beds first are seven in number; six of them measuring 200 ft. by 100 ft., while the middle one is about 150 ft. by 130 ft. The surface of sand in each of the filters approaches half-an-acre in superficial area. The square shape of the central bed allows room for the location in a central spot of the necessary permanent hydraulic sand-washing plant. Each bed is really a brick and concrete tank 9 feet in depth; the inlet for unfiltered water being on the northern side, while the outlet for the water after filtration is on the southern side. The unfiltered water flows from the pumping mains quietly on to the beds above the the sand level through the inlet-wells on the northern side. After sinking slowly through the sand, it finds its way into innumerable small brick channels formed on the bottom of the filter-tanks. These channels run east and west, and converge to the main collecting channel, which runs north and south from the inlet to the outlet well. The filtered water flows southward down this channel direct through the outlet-wells and regulating apparatus to the covered service reservoirs, and thence to the consumers.

The sand itself is 3 feet in thickness, and is of so fine a texture that 75 per cent. of it will pass through a sieve having 1600 openings to the square inch. In order to prevent it from being carried down with the water as this passes through it, it is supported on layers of shingle very carefully graded from coarse to fine; the finer layers being just under the bottom layers of the sand, while the bottom or coarser layers rest direct upon brick drains. The most scrupulous care was taken in the selection of the sand. It was thought undesirable, for many reasons, to have sea sand; and that which was ultimately used comes from the top of an uninhabited hill near Pulborough—thus ensuring against the remotest chance of any contamination. The shingle which supports the sand came from near the Needles, to the west of the Isle of Wight; but, notwithstanding this extreme care in the selection of the source from which these materials were to be derived, both the sand and the shingle were most carefully washed—a work the magnitude of which may be imagined when it is borne in mind that no less than 30,000 tons had to be dealt with.

The Reservoirs.

Each of the two new reservoirs measures 360 ft. by 160 ft., contains 13 ft. 6 in. depth of water, and has a capacity of rather more than 4 million gallons when full. Large as these reservoirs may seem to be on inspection, the capacity of each when full is no more than sufficient to supply Portsmouth for something like six or eight hours on a busy summer morning. The portion of the reservoirs lying outside and to the south of the filter-beds is covered with a ferro-concrete roof on the Hennebique system; the total area of roofing to both the old and the new reservoirs being 3 acres. From the new reservoirs a 30-inch outlet-main conveys the water to the base of the embankment of the old ones, at which point it is connected with all the gravitation mains of the Company. These connections were of an extremely difficult nature; the pipes varying in diameter from 12 to 36 inches. There were no less than 16 of them to make, and the work had to be done without interfering in any way with the supply to the district. By working on Saturday nights and Sundays for the most part, all these were carried out without any interruption to the supply. The two large service reservoirs built more than forty years ago, and situated to the west of the new works, and also the two small reservoirs a mile away, have also been covered with a ferro-concrete roof.

Some Features of the Works.

One of the most interesting features of the work has been the water-tighting of the floors and walls of the filter-beds and the new reservoirs. No less an area than 7 acres had to be dealt with, and the whole of this large surface was covered with two coats of cement rendering. The total thickness was 1 inch; the first coat being $\frac{3}{4}$ inch thick, and the finishing coat $\frac{1}{4}$ inch and brought to a fine, smooth face. The result has been extremely successful; the most careful tests, frequently repeated, disclosing no leakage whatever.

In two red-brick houses to the west end of the works are installed two Venturi meters. One of these registers all the water pumped on to the works, and the other that which passes out to the Company's district. The latter instrument not only registers the total flow, but keeps a continuous record of the rate of flow at every minute of the day and night; thus giving valuable information with regard to the requirements of the district from time to time. The readings of the two meters are compared week by week, and any failure to balance shows at once any defect in the whole works.

Some Statistical Information.

The filtering capacity of the works is 12 million gallons per 24 hours; and the high-level filtered water storage capacity is now no less than 14 million gallons, or very nearly 48 hours' supply. If the 3 million gallons of water in the filter-beds themselves are added, it is somewhat above this. It may be pointed out that in this respect Portsmouth is in a more favourable position than the Metropolis, which only possesses a high-level filtered water capacity of about a day's supply. In carrying out the works, no less than 200,000 tons of material had to be handled, 100,000 tons of which had to be brought by rail and transported up the hill. Some 800 tons of ironwork were used, 40,000 tons of portland cement concrete, 30,000 tons of filtering material, 6000 tons of concrete, and no less than 3 million bricks. These had to be of great strength, as in places the brickwork is subjected to a pressure of 9 tons per square foot; and they all came from the neighbourhood of Horsham.

Mr. Ashley added that the works had been admirably carried out, without any extras being incurred, by Messrs. John Mowlem and Co., of London, who were represented by Mr. Harvey Collingridge; the Company's Resident Engineer on the works being Mr. D. S. Williams. The amount of the contract was £73,092; and the final quantities and account have been settled —the total being £73,263, or only £171 in excess of the original amount. The whole of the money, less 10 per cent. retention, has been paid. The retention-money amounts to £7326; and it will be paid at the end of March next, when the Contractors' term of maintenance expires. The contract price includes all the pipes, special castings, &c., the connections between the new and old mains—in fact, everything necessary for the completion of the work as it now stands. No land had to be bought; that upon which the works are built having been acquired by the Company many years ago.

The weight of water distributed every 24 hours by the Company amounts to very nearly 40,000 tons. The population now under supply is approximately 233,500; and it is growing at the rate of between 3000 and 4000 per annum. The weight of water used by each consumer is something like 54 tons a year; and it is supplied and delivered into the consumers' houses at a charge to the consumer of slightly less than 1½d. per ton—a remarkably low figure when it is considered that water has to be obtained, pumped, filtered, stored, and distributed at an extreme distance of something like eight miles from its source. The total length of mains, which vary in size from 2 inches to 36 inches, is nearly 250 miles.

Some Appreciative Remarks.

At the close of Mr. Ashley's remarks, which were listened to with much interest,

Mr. Grant explained that the Directors, determining that the water supply of Portsmouth should be above suspicion according to the demands of modern sanitary science, had decided upon carrying out filtration works because of the cloudiness of the water at certain times after heavy rains. This cloudiness, which was due to the scouring-out of earthy matter from minute channels in the chalk, did not make it at all deleterious—at any rate, it had not affected the health of the town. But the Directors had faced their responsibility—recognizing that no great commercial undertaking (even a monopoly) could thrive in the long run unless it satisfied the reasonable needs of its consumers. Their endeavour was to satisfy the demands upon them in every way; and therefore the expenditure had not been studied in constructing up-to-date filtration works. He expressed great pleasure in proposing a vote of thanks to Mr. Ashley for his admirable work. The preparation of plans had been entrusted to him, and they were submitted to Mr. Charles Hawksley—one of the greatest experts upon water filtration works—who suggested a few amendments, which the Directors had accepted in their entirety. Messrs. John Mowlem and Co. had carried out the works at a cost of £73,000; and the contract had only been exceeded by £171. In conclusion, Mr. Grant expressed the hope that the relationship between the Corporation and the Company would continue to be of the most amicable character. The Company recognized that they had a duty to the town as well as to the shareholders. "Let us go forward hand in hand," he said, "as friends striving for a common purpose—namely, the good of the town. The Corporation should not grudge the shareholders of the Water Company a handsome dividend upon their enterprise, as a reward for the risks they ran at the commencement; and the Company on its part will not be unmindful of its duties to the community."

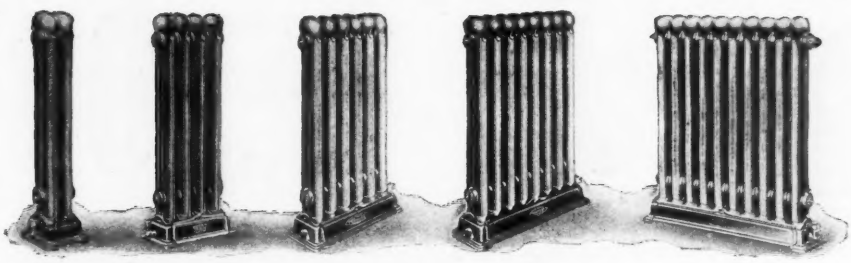
Sir G. Couzens, the Senior Alderman, speaking for the visitors, congratulated the Chairman, Directors, and shareholders of the Company on their very fine achievement, and also thanked them on behalf of the Corporation for inviting them to their new works.

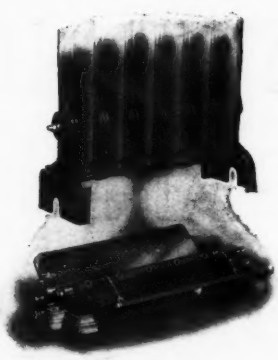
At the invitation of Mr. Grant, the company partook of tea in the reservoir; and at the conclusion of the repast they inspected the works in detail under the conductorship of Mr. Ashley.

The London and Southern District Junior Gas Association have received an invitation from Mr. E. Pilbrow, Superintendent of the Joint Gas Companies' Exhibit at the Japan-British Exhibition, to visit the exhibit at 3 o'clock next Saturday afternoon, and afterwards to take tea in the Garden Club at 4.30 p.m. Mr. F. W. Goodenough, Controller of the Gas Sales Department of the Gaslight and Coke Company, has kindly consented to preside.

The First Gas-Works at Stonyhurst College.—A correspondent sends us the following extract from the "Stonyhurst Magazine" for August: "An entry in the 'Stoneyhurst Chronology' under the date 1810 reminds us that the first College gas-works were constructed in that year. Their situation was that occupied by the present plumber's yard behind the east wing of the new College. From their construction till their removal in 1847 to their present site, the gas-works were managed by the College plumber, John Grayson—usually known as 'Jack Gas'—a noted character. Subsequently, increased pressure of work in the departments of plumbing and gas making made it impossible for the one man to exercise the functions of plumber and gas man; so the offices were separated. In this centenary year of the introduction of coal gas into the College, it may be of interest to record that the original College gas-works were the first private installation of coal gas for lighting purposes set up in this country."

Steamless Heating in 1910-11.





THE unique position occupied by Davis's PATENT STEAMLESS RADIATOR has been still further strengthened for the coming season. While retaining all the unique features which have made it so popular, it has been considerably improved from the all-important MAINTENANCE standpoint.

Every joint of every Radiator is machined.

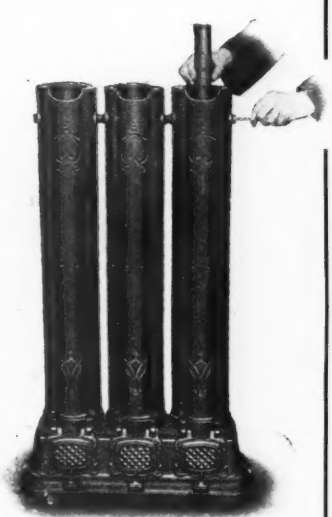
Every Radiator sent out is supplied with a base-plate.

The base is *entirely independent of the columns*, and to it are fitted the Burner, the Gas Connections, the Governor and the Regulating Jet. The two last-named form our NEW PATENT GAS CONTROLLER.

Special provision is made for right and left-hand gas connections.

The LUMINOUS "Steamless"

: AN ENTIRELY : : NEW DEPARTURE.



THE Luminous Steamless Radiator is manufactured in one, two, three and four column widths, all 38 in. in height.

The Luminous Radiator follows the well-proved "Steamless" principles, but possesses, in addition, many advantages of its own. It is more particularly designed for use where a heating apparatus of a decidedly cheerful appearance is required. A flame of the luminous type is used in combination with coloured glass panels. Each burner is under separate control, so that one or more may be turned down or out as the circumstances may dictate. The gas connection may be made on either hand.

Each Radiator is fitted with a table top, and by removing this (which can be done by taking out two screws only) the whole of the interior of the Radiator becomes accessible. The inner tubes may be readily withdrawn without disconnecting or dismantling the Radiator. These tubes, by the way, are of the same high-class quality as those used in the case of the standard Steamless Radiator.

DAVIS

Gas Stove Co., Ltd., Luton.

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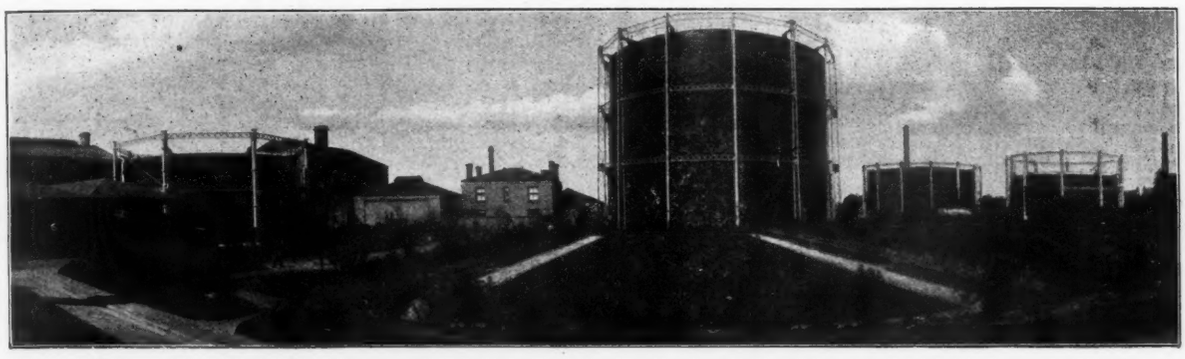
WEST'S GAS IMPROVEMENT CO., LTD.,
ENGINEERS,
MILES PLATTING, MANCHESTER.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Meeting at Cambridge.



The Cambridge Gas-Works as seen from the Office Windows.
[Recreation ground in the forefront, with quoit court, bowling green, tennis court, and shooting range.]

Assembling at Cambridge on Friday morning, the members of the Eastern Counties Gas Managers' Association found a programme of varied interest awaiting them; and a welcome on the part of the Chairman (Mr. E. H. Parker, M.A., J.P., D.L.) and Directors of the Cambridge Gas Company that could not anywhere be exceeded in respect of warmth and friendly feeling. What the visitors experienced so bountifully on this occasion, is the common continuous condition that prevails between the Board and their Engineer (Mr. J. W. Auchterlonie), who is this year the President of the Association; and what the mutual confidence and reliance that exist between Board and Engineer and Manager has produced in connection with the Company, was seen at the gas-works, which were the *rendezvous* of the visitors about noon. It is nine years since the Association formally visited the famous University town; and the greatest change that was noted was at the gas-works. The works, under Mr. Auchterlonie's engineership, have been remodelled and extended almost out of recognition by anyone who remembers pre-existing conditions; and it must be said after inspection and investigation that, in his technical and managerial work, Mr. Auchterlonie has served the Company wisely and well. His schemes and plans have not only produced works that serve the Company and Cambridge well, but they have included developments that have made his staff and men feel that they are part and parcel of the concern. The workers of the Company, from Chairman down to the lowest employee, are to-day a contented and happy party, all pulling in the one direction to secure prosperity for the undertaking.

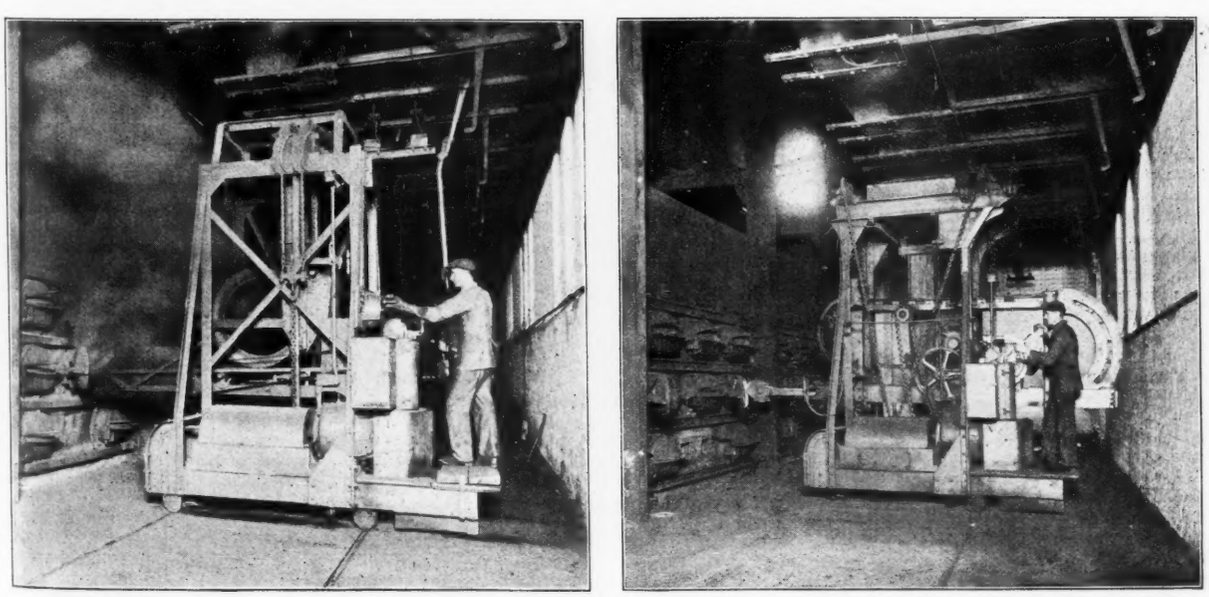
The details of the works are given below. But in walking round them, one felt the pleasures of cleanliness and orderliness abounding on all sides. To run over the work that Mr. Auchterlonie has carried out since he has been in charge would be to describe practically the whole of the plant. It was found that in the horizontal retort-house he has introduced De Brouwer machinery, and he finds the working of this house, under the new conditions, more economical than the inclined retort equipped one, which in its time has done more economical work than the horizontal house under the old conditions. What was one time economical, is now left behind by progress in other directions.

The De Brouwer plant necessitated an installation of electrical plant for driving; and to give this plant as much profitable work to do as possible, Mr. Auchterlonie uses the energy also for workshop driving. The range of new workshops that he has put in is a feature of the place, with their machine tools, which enable the works to be largely self-reliant in the matter of repairs and much new work. A new exhauster-house, excellently arranged and equipped, is part of the large scheme; and an elevated purifier-house, extensive and perfect in every respect, is another feature over which some time was spent. The evidence of the comprehensiveness of the engineering work that has been executed in late years is rounded off by the largest of the gasholders. Attractive in exterior architectural feature are also the new offices and (near by) the workmen's institute buildings; and internally there is also the material testimony to the thoroughness of design and provision. The board-room, drawing-office, and laboratory are of the special features of the block containing the offices; and the mess room, reading room, and billiard room, of the workmen's buildings. This is not a finished survey of the work upon which Mr. Auchterlonie has been engaged; but enough has been said to show that, since his advent in Cambridge, with the daily routine of a large business open to the competition of a well-managed Electricity Supply Company, the Engineer and Manager has not had many spare ends of time on his hands.

After what has been said, the following detailed notes on the works will prove of interest.

THE CAMBRIDGE GAS-WORKS.

The site upon which the works are built adjoins the River Cam; the entrance gates being on Newmarket Road. The area covered is about 15 acres in extent; and the works have been so arranged that extensions needed by the increase in business can be simply carried out. The site includes the men's recreation ground, which is tastefully laid out, with grounds for quoits, bowls, and tennis, and miniature rifle-range.



The DeBrouwer Charging and Discharging Machine in the Horizontal Retort-House.

The retort-houses are two in number. The retorts in No. 1 house are set horizontally, and consist of ten beds of eight through ⌂ retorts, 24 in. by 15 in. tapering to 21 in. by 15 in., and 20 feet long; the retorts in each setting being in two vertical tiers of three and two central retorts. The firing is on the full regenerative system. The retorts are charged and discharged from a stage by electrically driven De Brouwer machines, supplied and erected by Messrs. W. J. Jenkins and Co., of Retford.

Coal is delivered to the charging machine from overhead hoppers, to which the coal is supplied by a conveyor, after being elevated from a coal-store flanking the retort-house. The coal-crusher at the foot of the elevator, together with the coal-handling plant, is driven by a 43 H.P. gas-engine, which also drives the dynamo for supplying the current for the De Brouwer machinery and workshops.

The coke from the retorts falls through openings in the stage-floor into coke-barrows on the ground floor, whence, after being slaked from an overhead water-service, it is wheeled out into the coke-yard. No. 2 retort-house contains ten beds of six inclined through retorts of ⌂ section, 22 in. by 15 in. by 20 ft. long; the retorts in each setting being in three tiers. The firing is on the full regenerative system. The coal-crusher, elevator, and conveyor for this house are driven by a horizontal steam-engine.

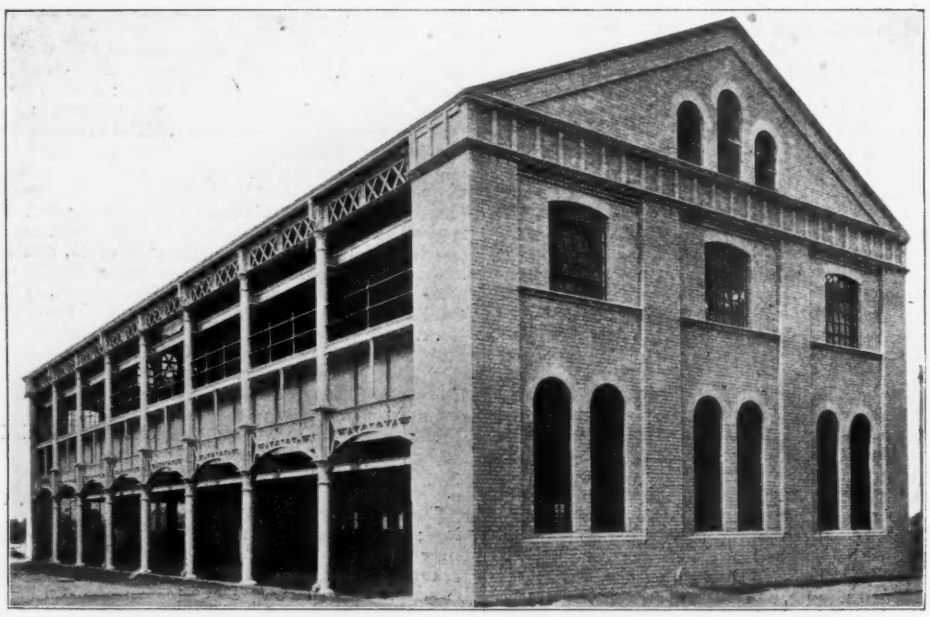
Both retort-houses are provided with retort-house governors and tar-columns. In addition to the coal-sheds adjoining the retort-houses in which the crushers are situated, there are two covered coal-stores, each capable of holding 2000 tons of stacked coal.

Following the course of the gas from the retort-houses, a brief survey of the remaining plant may be made. The condensers are of the water type—Morris and Cutler's patent. They consist of a cast-iron rectangular vessel, 30 ft. 6 in. long by 7 ft. 3 in. wide by 7 ft. 6 in. high, fitted with water-tubes.

In a well-appointed building, are housed three separate sets of rotary exhausters, each set driven by a separate horizontal engine. They consist of one single exhauster of 75,000 cubic feet per hour capacity, and a double set each of 50,000 cubic feet per hour, erected by the Bryan Donkin Company; while a smaller double set, having a capacity of 25,000 cubic feet per hour each, which does duty in the summer months, was made by Messrs. Gwynne and Co. All the exhausters are fitted with automatic governors connected to the steam supply to the engine.

There are three tower-scrubbers, by Messrs. Oliver, of Chesterfield, about 28 ft. 6 in. high by 6 feet diameter, fitted with wood gratings, and one washer-scrubber by Messrs. Kirkham, Hulett, and Chandler. An additional scrubber-washer has been placed in position by Messrs. W. C. Holmes and Co., of Huddersfield, and is capable of dealing with 2 million cubic feet of gas per day. It is driven by a horizontal steam-engine placed at the end; and provision is made for a future electric drive.

The new purifier-house, erected in 1906, from Mr. Auchterlonie's designs, by Messrs. C. & W. Walker, of Donnington, contains four boxes 40 ft. by 30 ft. by 6 ft. deep. These are mounted upon an iron staging in a large house constructed of steel framing, with brickwork enclosure on three sides, and open in front. The purifiers are all fitted with Clapham's "Eclipse" rubber joints. Milbourne's valves and patent fastenings are also provided. The covers are lifted by a travelling crane, by Messrs. Clapham Bros., traversing the whole length of the house. The oxide is emptied through the bottom of the boxes on to the revivifying-flow below. After revivification, the oxide is conveyed in large buckets, travelling on an overhead runway, to a hopper at the foot of an



Purifier House, with Four Oxide Purifiers, 30 feet by 40 feet, and 6 feet deep.

elevator, whence it is lifted to a band-conveyor at the height of the tie-bars of the roof principals, and discharged from an adjustable throw-off carriage, through canvas shoots, into any of the purifier-boxes. The elevator and conveyor are driven by a horizontal steam-engine; but provision has been made for electric driving in the near future.

After leaving the oxide purifiers, the gas is passed through three lime purifiers, each 30 ft. by 20 ft. by 4 ft. 6 in. deep. The boxes are on the ground floor; and the covers are fitted with water-lutes. There are also six small purifier-boxes, each 20 ft. by 10 ft. by 3 ft. 6 in. deep, which are used as catch-boxes only. Under these purifier-boxes, tar and liquor storage tanks are provided.

A Glover carburetter is fixed on the outlet of the purifiers, and "Rock Light" petroleum is vaporized with such satisfactory results that no complaint from naphthalene has been received in Cambridge for nearly two years, whereas a few years ago the trouble from this source was very serious.

The two station-meters, which are housed in tastefully decorated buildings, with open roofs, are of Messrs. Parkinson's make, and have a capacity of 50,000 and 30,000 cubic feet per hour respectively.

There are four gasholders on the works; their capacities being 185,000, 910,000, 280,000, and 530,000 cubic feet respectively—a total storage of over 1¾ million cubic feet. Of these, the largest was erected in 1905 by Messrs. C. & W. Walker, to designs prepared by Mr. Auchterlonie. Two governors serve the town, and a smaller governor supplies the Fulbourn Asylum, at a distance of three miles from Cambridge.

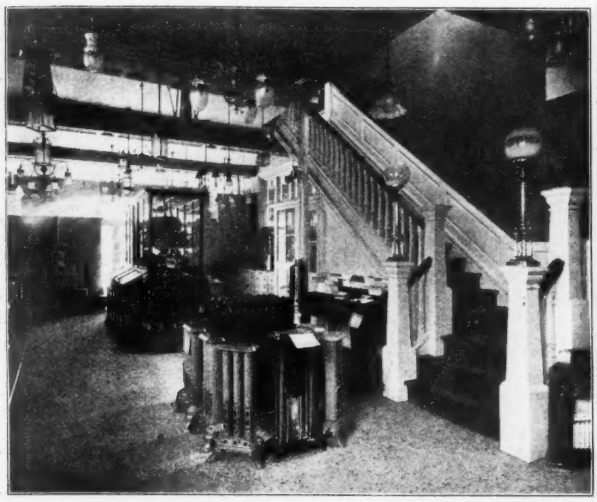
A new boiler-house, containing two Lancashire boilers, each 7 ft. 6 in. diameter, by 30 feet long, has recently been completed to Mr. Auchterlonie's designs. The boilers are by Messrs. John Thompson, of Wolverhampton. They are provided with forced draught for burning breeze; and each boiler is capable of supplying all the steam required on the works. The boilers are fed by the returned water from the gas-condensers. The front of the house is provided with rolling shutters.

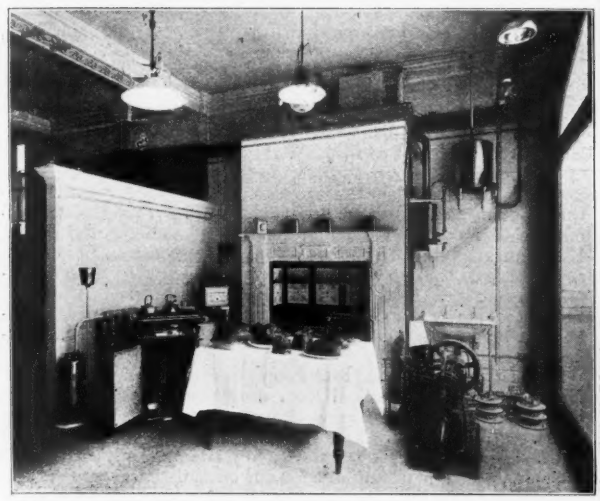
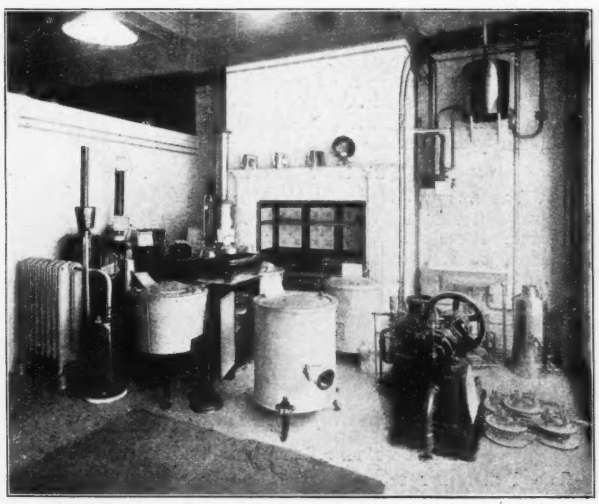
The tar and liquor is contained in three tanks, and is run down to the river, and taken in barges to King's Lynn. The necessary water for slacking coke is pumped up to an overhead tank from the river.

A complete range of new workshops, comprising engineers' shop, fully equipped with machine tools, smiths' shop, with power hammer and shearing machine, carpenters' shop, with planing and other machines and circular saw—all driven by electricity—has lately been added, in which all repairs required are capably dealt with.

A suite of new offices, consisting of coke office, works manager's office, drawing office, and a very completely equipped laboratory and board-room, together with fire-resisting stores, are contained in a well-constructed building of neat design, at the new entrance gates from Newmarket Road. In the laboratory there is a new recording calorimeter by Féry, manufactured by the Cambridge Scientific Instrument Company.

The workmen's comfort and welfare are provided for in the Workmen's Institute—a building in the same style as the offices, and facing same at the entrance. It contains a handsome mess-room (used also for concerts and meetings), reading-room, and billiard-room with full-sized table (the personal gift of the Directors to the Men's Recreation Club). The whole of the rooms are



Views in the Show-Room.

provided with a glazed tile dado of pleasing design; and the walls above are painted with enamel in subdued colours. The foregoing buildings were designed by Mr. Auchterlonie, and the work carried out under his personal supervision.

The total amount of coal carbonized last year was 35,100 tons; and the quantity of gas made in the same time was just under 400,000,000 cubic feet.

The show-rooms in Sidney Street are commodious, and attractive in appearance. They are fitted up in such a manner that no consumer coming into the offices to pay his account or give an order can fail to see the various appliances that the Company have for the consumption of gas. The offices also and workshops are spacious and well equipped.

The Visitors and their Hosts.

From the gas-works, the visitors were driven to the University Arms Hotel, where they were entertained at luncheon by the Chairman (Mr. E. H. Parker) and Directors of the Gas Company. Besides the Chairman, the other members of the Board present were: Mr. W. B. Redfern, Mr. J. B. Peace, M.A., and Colonel C. T. Heycock. Mr. H. Darwin was unavoidably absent. The officers of the Company were represented by Mr. Auchterlonie, the Secretary (Mr. A. E. King), the Accountant (Mr. G. W. Lawson), the Draughtsman (Mr. Hoff), and the Chemist (Mr. Wilkinson). The guests included the Mayor (Alderman Spalding), the Master of Corpus, Professor Pope, Mr. R. Stephenson (Chairman of the Newmarket Gas Company), the Manager of the Electricity Supply Company (Mr. Pierce), the Borough Surveyor (Mr. Julian), and the Borough Accountant (Mr. Gait). Between Company and Corporation, there prevails the utmost good and co-operative feeling; and there are no strained relations between the Company and their business rivals, the Electricity Company. The mention of the name of Mr. Pierce as being present as a guest was greeted with hearty applause.

After the generous luncheon,

The Chairman remarked that there was no set toast list, as there would be an opportunity of speaking later in the day. But he could not let this opportunity pass of expressing, on behalf of the Directors of the Gas Company, a hearty welcome to the members of the Association. He hoped that their visitors had been favourably impressed with what they had seen at the works; and he trusted they would find time to see something of the beauties of the town. He should like to say a special word with regard to his friend Mr. Auchterlonie, the President of the Association this year. The members had been over the works; and they had there seen the result of Mr. Auchterlonie's ability. The Directors were indeed much indebted to their Manager. The works had been very successful under his supervision; and they counted themselves extremely lucky in obtaining so able a man. They had present that day the Chairman of the Newmarket Gas Company, who was for years the Chairman of their County Council, and rendered in that capacity valuable service. They had also present the Chairman of the Cambridge Water Company, and the Chairman of the King's Lynn Gas Company. The Master of Corpus was also present. Some gas companies lived in awe of the corporations in whose districts their work was conducted; but in Cambridge the relations between the Corporation and the Gas Company were of the most friendly description. The Mayor was with them on this occasion. Among them, too, was the Engineer and Manager of the Electric Light Company. Personally, he felt greatly indebted to the Electric Light Company; for their appearance on the scene had helped to smarten the Gas Company up a bit. He hoped that Mr. Pierce would be duly impressed as he looked round the room with the sort of competition with which he and his electrical colleagues had to contend. [Laughter and applause.] He asked those present to drink to the health of his Worship the Mayor.

The Mayor, in responding, thanked those present most sincerely for the compliment paid him. On behalf of Cambridge, he also heartily welcomed the visitors; and, in the course of further remarks, he referred to the excellent supply of gas with which the streets of the town are so well lighted.

Mr. C. F. Ruggles (Leighton Buzzard) said the members could not leave the table without thanking the Cambridge Gas Company for entertaining them in such princely manner as they had done that day. Each town in which the Association were privileged to meet, the Chairman and Directors had been most courteous and good to them; and exceedingly so had been the Chairman and Directors of the Company whose guests they were that day. [Applause.]

The Chairman thanked Mr. Ruggles for his kind words and the members for the manner in which they had endorsed them. With him, his fellow-Directors agreed that meetings of this kind were very useful to the whole gas industry. The interchange of ideas that took place on such occasions must be good, and must bear fruit.

THE BUSINESS MEETING.

The members were privileged to hold their business meeting in the handsome new Lecture Room of Emmanuel College. It was

regretted that Mr. John Young, the retiring President, could not be present to preside at the opening proceedings, but his predecessor in the presidency (Mr. C. F. Ruggles, of Leighton Buzzard) undertook the duties at the opening.

The Hon. Secretary and Treasurer (Mr. T. A. Guyatt, of Ely) read the minutes of the meeting held at Great Yarmouth on April 29, and they were confirmed.

Among the letters of apology for non-attendance was one from the President of the Institution of Gas Engineers (Mr. Alexander Wilson, of Glasgow).

New Members.

On the motion of Mr. J. Barton (Peterborough), seconded by Mr. J. H. Troughton (Newmarket), the following names were added to the roll of membership: Mr. G. H. Gibbs, of Diss; Mr. G. M. Gribble, of Kirkby-in-Ashfield; and Mr. G. H. Judd, of Sheringham.

District Member of the Council of the Institution.

Mr. J. Carter (Lincoln) said it was with peculiarly mixed feelings that he moved that their President (Mr. Auchterlonie) be the representative on the Council of the Institution. When he said he rose with "mixed feelings," he meant that he could not avoid entertaining some sentiments of regret that the Council of the Institution would lose the valuable services of Mr. John Young. He could only hope that some means would be devised whereby Mr. Young's more permanent position on the Council might be secured. It had been the practice of the Association to elect the President as their representative on the Council; and certainly this year they were not for a single moment likely to consider the question of varying their procedure. They would feel much honoured by the representation by Mr. Auchterlonie.

Mr. G. Baines (Harwich) seconded the motion, and it was unanimously carried.

The New President.

Mr. Ruggles, in introducing the new President, said no words were needed from him regarding the fitness of Mr. Auchterlonie to be their President. They had that day alone seen sufficient of him and his work to recommend him to them as a gas engineer. He was one of many in the profession whom they all honoured; and not only as a member of the gas profession, but as a member of the Association they all respected him. They were proud indeed to see him holding the position in Cambridge that he was doing. They wished him a prosperous year of office; and hoped that he would see the Association during the year prosper as it had done in the past.

The President was heartily received as he took the chair.

Thanks to the Retiring President.

The President remarked that his first duty was to move a hearty vote of thanks to their retiring President, Mr. John Young. They all regretted he was not with them that day. He was unavoidably absent in Scotland, and had written to him (the President) to say it was impossible for him to be present, much as he would like to have been. Mr. Young was one of the ablest Presidents the Association had had; and he (Mr. Auchterlonie) was personally very sorry to depose him both from the chair and from representation of the Association on the Council of the Institution.

Mr. J. Davis (Gravesend) seconded the motion, observing that, as a member of the Council of the Institution of Gas Engineers, he knew as well as anybody the value of Mr. Young's services; and it was with regret that he found Mr. Young was now retiring. He hoped that some steps might be taken to see that Mr. Young was continued on the Council.

The motion was heartily endorsed.

The President then delivered the following:

Gentlemen,—My first duty in addressing you is to thank you for the honour you have conferred upon me in electing me President of this Association. It shall be my earnest endeavour to serve the best interests of the Association during my presidency; and if I am unable to shed additional lustre on the high office, I trust I may hand it over untarnished to my successor.

In this address I propose to speak briefly on a few topics that may be considered of every-day interest to us as a profession at the present time, without attempting to give you a mass of figures and tables that cannot be grasped at the moment. We can all recall able addresses, full of valuable information, the subject-matter of which has been practically lost to students on account of its not being analyzed and indexed in the Technical Press. This information, had it been in the form of a paper, would have been easily found in the excellent system of cross-indexing adopted by our technical journals. In this connection, I think a word of recognition is due to our Technical Press for the instructive articles that appear from time to time relating to the latest developments in gas practice on the Continent, in America, and in the United Kingdom.

Our District Associations throughout the country continue to do splendid work in the interests of the gas industry at large; and the Eastern Counties Association can be congratulated upon its vitality and on the keenness of its members. This enthusiasm and *camaraderie* among gas managers is not, however, confined to the United Kingdom; for in our Colonies and in America, as well as on the Continent, we have energetic and able *confrères* all doing valuable work. In June last, at the Brussels Exhibition, we had the unique spectacle of French, German, Belgian, and British gas engineers fraternizing in the most cordial manner; and in a few days the British Institution of Gas Engineers will be welcoming the German Association, who entertained so kindly the large party of British gas engineers who visited Berlin two years ago. To judge from the programme, their visit should be enjoyable as well as instructive; for, after visiting the London and Croydon Gas-Works, they are to visit the gas-works of Edinburgh and Glasgow, where they will be received by the Provosts of the cities. We trust their visit may be as enjoyable as was ours to Germany.

The duties of a gas manager may be roughly divided into three heads: (1) The buying of the raw material; (2) the manufacturing of such material into gas, coke, and other residuals; and (3) the selling of products, with all the duties pertaining thereto.

Coal—Increase in Price.

Briefly considering these duties in the order stated, we find, under the first heading, that coal—the chief of our raw materials—has gone up slightly in price since last year. The cause of this advance has been attributed to the working of the Mines Eight-Hours Act, which became law on July 1, 1909. Undoubtedly, the operation of the Act has caused an increase in the costs of working at some collieries; but considering the increase in the number of pits being opened, and the improvements in the methods of working, I think we may fairly believe that prices will gradually adjust themselves to a somewhat lower level. At the same time, prices must ever be regulated by supply and demand.

The recent Board of Trade returns for the coal industry afford much interesting information. The output of coal in the United Kingdom during the year 1909 amounted to the enormous quantity of 263,774,000 tons—being an increase over the output of 1908, but a decrease on that of 1907. When we consider that the output of coal in 1885 was only 159,351,000 tons, we recognize the great expansion that trade has undergone during the past 25 years. Notwithstanding the enormous drain on our supply, the Royal Commission of 1905 estimated that the coal available in the United Kingdom amounted to 100,914,668,167 tons, which is an increase of over 10,000,000,000 tons on the amount estimated by the Commission in 1871. This seems extraordinary; but it is, of course, accounted for by the fact that to-day more information is available for the accurate estimation of the extent of the British coal-fields.

It is, I think, important that every gas manager should test and tabulate the results derived from the various coals he has purchased, so that the relative values of the different varieties may be correctly assessed. This is not always an easy matter; but as it is absolutely necessary for us to buy as cheaply as possible the class of coal most suitable for our circumstances, the various systems for such an assessment that have lately been brought before the industry are well worthy of attention.

Manufacture.

To turn now to our manufacturing methods. It has long been an adage that dividends were made in the retort-house; but until the advent of the Siemens furnace and its introduction into gas-works, it is to the present generation of gas engineers surprising how little progress was made in the carbonization of coal from the days of Murdoch. Since the introduction of the Siemens furnace, however, a great advance has been made; and in the past ten years the improvements in the methods and in the results obtained have been both revolutionary and amazing. New systems have been brought out, tried, and adopted with such rapidity that no gas engineer can be sure that a system adopted this year will not be superseded next year.

Inclined Retorts.

At Cambridge, inclined retorts were adopted some ten years ago. Owing, however, to the difficulties encountered in the use of coal varying in physical properties, the system was not extended when the second house of direct-fired settings was re-modelled in 1904. Horizontal retorts were adopted, with De Brouwer electrical charging and discharging machines. We have been well satisfied with the economy effected, and with the improvement in results; but I should not like to say that if I were to-day called upon to re-model another retort-house, I should recommend the adoption of the system in preference to vertical retorts. All of us who visited Berlin two years ago must have been impressed by the simplicity and ease with which the experimental installations of vertical retorts were worked. Since then vertical settings have been much improved; and there are now some thousands of these retorts in use on the Continent. In this country also many minds are at work, and we have various systems of vertical retorts in use on a large scale. There is every reason to believe the many difficulties in the way of continuous carbonization will be solved successfully, and that at no distant date the conditions of working in our retort-houses will be enormously improved.

We are glad to know that both the Woodall-Duckham and the Glover-West systems are being introduced abroad. The former is reported in the "Times Engineering Supplement" as having been adopted at Lausanne after successful competition with the German systems. At Edinburgh and Glasgow, we have further installations being tried; so that shortly we shall have before us the data necessary to enable us to decide as to the best systems to adopt in our future extensions or reconstructions. Chamber

settings also are being tried on an extensive scale; and there is a healthy activity that augurs well for the future improvements in this (the main) department of our factories.

COALITE.

Professor H. E. Armstrong, in a paper read before the British Association at Sheffield, while admitting that great improvements were in sight in the application of gas to heating purposes, and that the use of gas is likely to be largely extended in the near future, criticized most adversely the present methods of gas manufacture. He advocated the manufacture of what is known as coalite—high-grade gas and tar rich in oils. We have yet to learn that the gas companies who have experimented with this system are satisfied with it; but we do know that the inhabitants of one of the towns are far from satisfied. Few, I think, will agree with the professor that the solution of the smoke question will be by the manufacture of gas of high quality and coalite; but I do agree with him that the public require rousing from what he described as their lethargy regarding the smoke nuisance; and, as the Americans say, it is "up against" gas undertakings to combine and undertake this duty.

PURIFICATION METHODS.

Purification methods continue to improve and to be much better understood. All of us—especially those who still use lime—must regret that no further experiments have been made for the purification of gas on the Claus system.

NAPHTHALENE.

Many gas-works have reported that they have overcome naphthalene troubles. I am glad to say that since December, 1908, we have not had at Cambridge one single complaint attributable to naphthalene; whereas previous to our introducing the Glover carburettor, we had occasionally as many as thirty stoppages in one day. Having at his command so many successful methods of overcoming the nuisance, no gas manager is justified in not trying one or other of the systems, if he is having trouble with stoppages from this unstable hydrocarbon.

FIRE-CLAY GOODS.

Much has been said of late regarding the material used in the manufacture of our fire-clay goods. It may interest you to know that in the horizontal house which most of you inspected this morning one setting has worked 1626 days—having been in use since 1904, and let down on four occasions. Another setting has been in use since the same year, having worked 1540 days, and let down also four times. Other settings, built at a later period with material from the same firm, are in a worse condition to-day although they have worked only 1100 days. This difference I attribute more to the setting of the retorts than to the material. The investigation on the qualities of refractory materials opened by the Institution of Gas Engineers cannot fail to do much good; for the first cost of the material in our retort-stacks is a secondary consideration to its quality.

COMMERCIALISM.

At no period in the history of the gas industry has more attention been required from gas managers to the profitable disposal of our chief manufactured article—gas—and the secondary products—coke, tar, and ammoniacal liquor or sulphate of ammonia. The conservation of our existing business, and its development in the future, occupies much more of our time than was the case in days gone by. We can congratulate ourselves that, notwithstanding keen competition in every department of our business, gas undertakings continue to prosper and grow. In the year 1882, there were 500 statutory undertakings, with a capital of £50,261,118, manufacturing a total of 72,583 million cubic feet. To-day, there are 790 gas undertakings, with a paid-up capital of £130,708,693, manufacturing 189,918 million cubic feet. This great increase has, of course, been due to various causes, but principally to the large number of cookers that have been introduced, and to the enormous development of the slot-meter.

Formerly, gas companies' officials were wont to be twitted for their want of enterprise. But to-day I do not think that any other industry in our country shows more enterprise than the gas industry; for, not only have we introduced slot-meters for the sale of gas to our customers in pennyworths, but we hire out almost any article that can be used for the purpose of consuming gas, and do everything reasonably possible to meet the needs of the public.

GROWTH OF THE SLOT-METER.

It is a little difficult to see how the growth of slot-meters and cookers can continue in the future as it has done in the past. Our districts are already well supplied with them, and in the future the expansion in these directions must necessarily be on a diminished scale. There is one field, however, for our commodity which still offers scope for exploitation; I refer to the heating of our dwelling-houses, shops, &c., by means of gas fires and stoves. Public feeling at the present time is just awakening to the necessity for preventing the smoke nuisance. The London County Council tried last session to get Parliament to move in the matter, and deputations have waited upon the President of the Board of Trade with reference to the subject. I venture to think that the gas companies of this country are destined to play a very important part in the solution of this question, and that the heating of our homes, as well as the lighting and cooking in them, will be done by means of gas.

GAS-FIRES.

Much investigation has been carried out within the past two years, and gas-fires have been improved enormously within that period. Last season alone the improvement was marked, and the increased demand for gas-fires was greater than in any past year. The Institution of Gas Engineers and the Leeds University are to be congratulated on the work done by the Research Committee. Personally, I am not certain that the gas-fire as at present designed is likely to be the gas-fire of the future. In my opinion there must be some considerable alteration in its appearance before long; and, in this connection, I think the Society of Architects ought to be approached with a view to enlisting their co-operation in deciding on the form that the gas-fire will ultimately take. At the present time, the main essential required for the solution of the heating problem is a cheap supply of gas of fair heating power. The public must be able to employ gas in large volumes at a low cost before we can induce them to instal gas-fires for all-day use and throughout every room in their house.

GAS *v.* COAL.

Professor Graham, of Manchester, stated in a lecture "that gas at 1s. 6d. to 2s. per 1000 cubic feet could compete for all-day use with coal;" but whether or not this is a correct estimate must depend on the cost of the coal. One of the difficulties in meeting this demand for cheap fuel lies in the fact that we are compelled to manufacture a gas of fairly high illuminating power to meet the requirements of those consumers who are not sufficiently wise to use incandescent burners for lighting purposes.

TWO QUALITIES OF GAS.

The late Mr. Bryan Donkin, in 1902, at a meeting of the shareholders of the Crystal Palace District Gas Company, made the rather startling proposal that gas companies should manufacture two qualities of gas—a lighting gas and also a low-grade gas for power purposes, so that manufacturers would be induced to build factories in the vicinity of the gas-works where they could get a cheap supply of gas for power and industrial purposes. To-day, in view of our wider experience in the carbonization of coal and coke, and of the comparatively smaller cost of a second distributing system under high pressure, such a proposal is not so impracticable as it was a few years ago. The thought naturally arises that if we are compelled to maintain gas of high illuminating power for lighting purposes, a dual distributing system should enable us to capture also the domestic heating business. In addition, however, to a second distributing system, we should require practically a new gas-works; and the additional expenditure of capital would be a serious consideration. I am inclined to think that what will occur, in spite of Professor Armstrong's advocacy of high-grade gas, will be that gas companies will supply gas of lower illuminating power, and the few consumers using flat-flames will be compelled to adopt incandescent burners.

Some corporations have shown that they are quite alive to the desirability of having a purer atmosphere for their cities, and to the possibilities of securing this by means of a cheap supply of gas. Glasgow is one of the most enterprising of these corporations. Before 1882, the illuminating power of the gas supplied in Glasgow was 25-candle power. In 1882, it was reduced to 20 candles, in 1901 to 16 candles, and in 1907 the No. 2 "Metropolitan" burner was prescribed as the testing-burner. This year Parliament has reduced the standard to 14-candle power without opposition. At the present time the Corporation are holding an exhibition of appliances for the abatement of smoke.

ILLUMINATING POWER AND CALORIFIC STANDARDS.

If gas undertakings had been sufficiently alive to the interests of the public, we should not to-day be agitating for a uniform standard for the testing of the illuminating power of gas. Such standard would have been abolished altogether, and a calorific standard would have been the test in use. The illuminating power standard of to-day is applicable to only a small part of our consumers—viz., those using old-fashioned naked flat-flame burners—who constitute something like 10 per cent. only of those using gas for lighting. For all other purposes, the heating quality of the gas is the true index of its value. The public require to be educated on these questions; but unfortunately, in spite of the immense issues at stake, there are no funds available for propaganda work in the direction of enlisting their interest and support.

NO. 2 BURNER BILLS.

Last session 57 gas companies promoted three Bills in Parliament for the substitution of the No. 2 "Metropolitan" burner for the various standards at present in vogue throughout the country. The Bills successfully passed through the House of Lords and through the Committee stage in the House of Commons. They have, however, received opposition from a small number of corporations; and it is a significant fact that the principal opposition has emanated from those carrying on electricity undertakings in competition with gas companies. Parliament has prescribed the burner in the Acts of all undertakings who have recently applied to Parliament (some 97 in number); and it is only reasonable to expect that the Burner Bills now pending will become law in the beginning of 1911.

HIGH-PRESSURE LIGHTING.

High-pressure lighting continues to make considerable headway both in England and on the Continent. The Sub-Committee of the Bradford Corporation recently reported that the Berlin

Municipal Council had spent £50,000 a year for the last three years in replacing their old lamps—both gas and electric—with new high-pressure inverted gas-lamps. They have decided to continue these improvements at the same rate for the next four years, at the end of which period there will be no electric public street-lamps left in Berlin. In London, also, this system has been largely adopted for street lighting; and in some of the best streets in Westminster (including Regent Street and Piccadilly) gas lighting is replacing electric lighting. Other forms of inverted burners and inverted lamps have commended themselves to the public; and shopkeepers all over the country are recognizing that outside gas-lamps are the cheapest and best means for the efficient lighting of shop windows. They enable the shopkeeper to display his goods to greater advantage and without risk of fire.

FREE MAINTENANCE.

Much has been said regarding the question of free maintenance of incandescent burners; but up to now there are few gas companies who have adopted any such costly scheme. Personally, I am an advocate for the free supervision of consumers' incandescent burners, gas-fires, &c. My experience is that consumers will not keep their burners in the necessary efficient state to procure the best light possible; and it is exceedingly disheartening to find that, after a good installation of incandescent gas lighting has been made, the burners are neglected and, for the want of a little attention, what should have been a good advertisement has become rather the contrary. It is, therefore, in the interests of the consumer that every incandescent burner in use should be inspected periodically. It is a large concession to make to the consumer; but I am certain it must be faced at an early date.

COMMERCIAL SECTION MEETINGS.

The profitable disposal of the secondary products of gas manufacture is necessary for the success of a gas undertaking; and nothing but sound commercial management can secure this. A word of appreciation is due to our Commercial Sections for the good work they have done in this respect. Personally, I am of opinion that more real benefit is gained by members attending these informal gatherings than can be derived from our more formal District Association meetings.

PROFIT-SHARING.

Much time and thought are given to the purchasing of coal, to the installation of up-to-date appliances in our gas-works, and to the sales of gas and coke, &c. But there is one great factor on which we largely depend for the success of our undertakings; and that is the human element. The sum paid annually by this Company in salaries and wages amounts to £13,000. This is a large proportion of the total expenditure; and until Sir George Livesey taught us what could be done by co-partnership, gas companies did little more than see that the workman did his allotted work. My Directors recently inaugurated a scheme of profit-sharing; and I am hopeful it will encourage workmen to put heart and brain into their work, and so make the scheme a success in their own interest as well as that of the Company.

ADVERTISING.

I have already mentioned the desirability of money being raised for the purpose of educating public opinion regarding the smoke abatement question, and the possibility of gas-fires being largely instrumental in the solution of this question. Another matter in which co-operation of gas undertakings is necessary is advertising. Recently "advertisement articles" on behalf of the electrical industry have appeared in the daily press. These articles were unjustifiably laudatory; and the statement that electricity was as cheap as gas could only be justified if the very worst form of gas lighting were compared with the most recent and up-to-date modern electric lamp. Many people, however, seeing the statements printed in the form they were, believed them true; and so indifferent were the gas companies that the statements were practically unrefuted, and what should have been the business of every gas company was undertaken by nobody.

There are no less than 133 millions of capital invested in the gas industry; and it would be interesting to know what amount is spent in advertising. It is not sufficient to depend on local advertising. Every gas undertaking throughout the country is interested in what appears in the London daily papers and magazines; and, while credit is due to the London Companies for what they do in the way of bringing before the public the advantages of using gas for various purposes, it is not equitable that gas undertakings throughout the country should gain the advantage of such enterprise on the part of the London Companies, and pay nothing towards it.

Money is badly wanted for safeguarding the interests of our industry as well as for research work; and no time is to be lost in enlisting the active support of our directors and committees; for, unless they recognize the need for co-operation, little advance will be made in the collection of the necessary funds.

THE FUTURE OF THE PROFESSION.

A recent advertisement for an assistant produced the large number of 110 applications for the post. From the number of applications, it is evident that the professional supply is greater than the demand; and it is equally evident that all these embryo engineers will not find posts as managers for many years to come. The qualifications of many of the young men were of a high order. Yet I predict that in gas engineering, as in other walks of life in this country, a still higher standard of education and training will be called for from men who aspire to climb to the top of the profession. Character, however, must ever remain the chief essential for success in life. The youth who is honourable, trustworthy, and industrious, and who is endowed with common sense, must ultimately surpass his more brilliant competitors, who may lack the qualities of rectitude or the capacity to apply their theoretical knowledge to every-day problems.

THE SUITABLE WORKER.

I am glad to see that the question of training gas-fitters has been taken up by the Manchester District Institution of Gas Engineers and by some of the larger of the companies. No one who has had experience of the distribution side of our business can fail to realize how important it is that everyone of our employees who is called upon to meet gas consumers should be thoroughly versed in all that pertains to the welfare of the industry. Our meter inspectors and collectors come into contact with every consumer in our districts four or eight times every year. They, therefore, ought to be the fingers on the consumers' pulse—interpreting and anticipating their requirements, and reporting promptly to head-quarters what they consider necessary to satisfy reasonable needs.

I think that gas managers too often fail to realize that their subordinates have not the same opportunities for acquiring knowledge on gas distribution subjects that they themselves have. We hear the reports of Research Committees—on gas-fires, for instance—and we understand the various improvements that are being made in all appliances; but what steps do we take to ensure that our knowledge is conveyed to the man who is responsible for the recommending of a gas-fire or for its fixing? I fear that too often the answer will be that the fitter has to find out for himself how the appliances act, without understanding the why and the wherefore of their construction.

Last winter, at Cambridge, we had some lectures on gas-fires and geysers. The lectures were very kindly given by representatives of makers of such articles; and the whole of the outdoor staff, as well as the show-room attendants, were present. The employees were interested; and questions were answered after the lecture, with, I am sure, considerable benefit to everyone present. Something of this nature, with the co-operation of manufacturers, could be carried out in every town, with but little trouble or expense.

During the past winter, also, my Directors paid the fees of sixteen of our youths to attend a plumbing class at the Technical School here; and I am hopeful that the course will be continued during the coming winter. I think that, to ensure that our boys are properly trained, their fees must be paid. I regret to say the young lads of the present day do not seem to have sufficient ambition to improve their knowledge by their own exertions and at their own expense; and if gas companies are to have a highly-trained body of workmen, they must take the necessary steps to train them during working hours.

It would be a great advantage if our Technical Press would publish a series of articles in simple language bearing upon the different subjects that gas-fitters should know more or less, in the form of lectures to working gas-fitters, to be afterwards published in cheap book form. At the present time, there is no text-book that can be put into the hands of our young men; and it is rather a serious matter for a gas manager to have to face the providing of lectures or demonstrations for the education of his workmen. A little magazine has recently been issued to supply this want; and it is sufficiently cheap to enable gas companies to place it in the hands of most of their workmen. One question I am glad to see discussed is that of "Unaccounted-for Gas;" and I hope that experiments will be carried out to demonstrate whether a lead joint is the best one for jointing pipes for the supply of gas. Recently I heard of a case where a joint withstood over 2000 lbs. of water pressure, and yet failed to prove tight with less than 20 lbs. of gas pressure; and I quite anticipate that companies who are depending on cast-iron mains and lead joints for high-pressure distribution will, in course of time, find their unaccounted-for gas go up enormously.

CONCLUSION.

I feel that this address has already been unduly long. There are many points in it that I should have liked to enlarge on, and other points on which I have not been able to touch at all. My chief difficulties have lain in the selection of the subjects which I hoped might interest you, and in the lack of the necessary literary ability to present them to you in an attractive manner. Nevertheless, I hope that, in spite of the very brief treatment I have accorded to some of the heads, I may have here and there provided food for thought; and it now only remains for me to thank you cordially for your patient and appreciative hearing.

At the conclusion of the address,

Mr. R. G. SHADBOLT (Grantham) said this was a happy stage at which to express their thanks to the President for the address he had presented to them. If anything were needed to confirm the selection of Mr. Auchterlonie as their President, the address would meet all requirements. It showed him to be a man in front in everything connected with the industry in which he was engaged, one who was in touch acutely and actively with every phase of the industry, from the point of initial manufacture to the point of policy in commercial matters, together with the more rational treatment of his workmen. The features of the address

marked Mr. Auchterlonie as well worthy the positions he held both in Cambridge and as President of the Association.

Mr. F. PATERNOSTER (Felixstowe) seconded the motion.

GAS PUBLICITY.

Mr. W. E. PRICE (Hampton Wick) remarked that, as a visitor to the meeting, representing the Southern District Association of Gas Engineers and Managers, he should be sorry if he missed the opportunity of saying a few words in praise of the address of the President. It was an address which bristled with thoughts and ideas. There were one or two points to which he (Mr. Price) would like to refer. As probably most of those present knew, he was particularly interested in one of the questions dealt with by the President. That was gas advertising; and he wished to take this opportunity of saying how much some of them were feeling and appreciating that the time had arrived, and indeed had long since arrived, when something should be done by the gas industry to bring before the public the fact that gas lighting, gas heating, and gas cooking were at any rate not second to any other means that could be used for these purposes. He was afraid the gas industry, generally speaking, had been sitting still, and letting the rival do the work of advertising. Some of them had been getting together, and were trying to bring this matter to a head on behalf of the gas industry. He hoped those present would be pleased to hear this, though he was unable at the moment to tell any definite story as to what would be done in the near future. However, the matter was having serious consideration; and he thought they might be safe in accepting the information that before long they would hear that a move had been made. This was a matter that everyone present would have to bring home to his Board of Directors, because it was a matter involving £ *s. d.* If the Committee who had the matter in hand brought the scheme to an issue (which he had no doubt they would do in the very near future) this would be one portion of the work. But the greater portion would be what they would individually have to do, and that was to approach their Boards of Directors, and get the wherewithal to carry through the scheme. The sum that would have to be spent on this movement would be not less than £20,000 a year. This only meant about 2s. 6d. per million cubic feet of gas made. If gas undertakings would support the movement to the extent of 2s. 6d. per million cubic feet, £20,000 would be collected; and then, instead of seeing the front page of the "Daily Mail" illustrated by pictures of electric lamps, they would be able to show with equal prominence what the gas industry could do with gas lighting, heating, and cooking. He hoped members would think over this matter, and be ready to bring it before their Directors when the time came, which he was certain would not be long.

The motion regarding the vote of thanks to the President was heartily passed; and the PRESIDENT briefly acknowledged it.

THEORY AND PRACTICE IN ENGINEERING.

The PRESIDENT said the next item on the *agenda* was a lecture on "Theory and Practice in Engineering" by Mr. J. B. Peace, M.A. This gentleman was one of his own Directors.

Mr. PEACE remarked that he was glad to have the opportunity of welcoming the members to the college, of which he was one of the officers. He then proceeded to deliver the lecture which is reproduced on this and succeeding pages.

At the conclusion of the lecture,

Mr. THOMAS GLOVER (Norwich) proposed a vote of thanks to Professor Peace. He said it was quite seemly and right that in a university town there should be on the Board of the Gas Company a member of one of the colleges. But it was quite unexpected by most of the members of the Association that they would have the honour of hearing a member of a Board of Gas Directors lecture in the way Mr. Peace had done that afternoon. It had been exceedingly kind of Mr. Peace to go to the trouble he had done in preparing his lecture, and to come to their meeting to deliver it. The members were materialists—confirmed materialists he was afraid; and it was right they should be occasionally brought back to theory, and to know the base principles upon which all scientific processes were founded. But they were materialists; and he was afraid many of the beautiful theories they had imbibed in their early days had been crushed out of them by having to produce balance-sheets. They had now merely to go on picking up a few scraps of scientific knowledge, and be brought back to the base principles occasionally when they were favoured as they had been by Mr. Peace. So he hoped, in spite of the fact that they had not all been able to follow the lecture quite in such an intelligent way as they might have done had they been students at the University and attended lectures there regularly, yet they would take back some ideas which would help to bring "heaven back to them," and make them idealists again—at any rate, to some small extent. They were all conscious of the fact that their process of gas making was accompanied by great waste. Professor Peace had been telling them about the heat balance in steam and gas engines; and this reminded him (Mr. Glover) how their process of gas making was accompanied by shocking waste of heat. Look at the beautiful heat lost in the process of drawing the coke, and through the volumes of water used in cooling the gas down to recover the ammonia. It was good that they should occasionally be brought back to view these things as they existed.

Mr. W. B. FARQUHAR (Ilford) seconded the motion.

The PRESIDENT said he was personally indebted to Mr. Peace for what he had done for the Association that afternoon.

Mr. PEACE, in his acknowledgment, said it was very kind indeed of the members to have listened to him so patiently. As they had come on this occasion to one of the seats of learning, he had thought that it would be worth while to give them some abstract notions on the subject of engineering. Although he had to theorize, he ranked himself as a practical man, as he had to deal in his various capacities with very practical things.

PLACE OF NEXT MEETING.

On the suggestion of Mr. F. PRENTICE (Ipswich), seconded by Mr. H. WIMHURST (Sleaford), the place of next meeting was left to the discretion of the Committee.

A VOTE OF THANKS.

Mr. J. H. BREARLEY (Longwood) moved, seconded by Mr. C. F. RUGGLES (Leighton Buzzard), that a hearty vote of thanks be passed to the Master and Fellows of Emmanuel College for their kindness in allowing the meeting to be held in the new Lecture Hall of the college.

DINNER.

In the evening, the members and visitors dined at the Lion Hotel, with the President in the chair. Those who were the hosts at the luncheon, together with the representatives of local municipal life and of the University, were the guests at the dinner. The toast list was a comprehensive one; and during the evening the Chorister Glee Singers of King's College Chapel rendered charmingly some beautiful quartettes, duets, and songs.

THEORY AND PRACTICE IN ENGINEERING.

By J. B. PEACE, M.A., of Emmanuel College, Cambridge.

[A Lecture delivered before the Eastern Counties Association of Gas Managers, Sept. 23.]

When your President invited me to address you to-day, he left me quite unfettered as to my choice of a subject. Had he suggested that I should open a discussion on any of the current technical questions of gas engineering and management, I should have considered that he had fallen short of his normal sanity of judgment, and I should not have treated his suggestions with the respect which the uniform sagacity of his advice to his Board has very properly earned. Having thus a free hand, I put down as the title of my lecture something which is at least—to use your own words, Mr. President—sufficiently comprehensive. But I will confess that I had hopes of treating my subject from the point of view of problems which, though less familiar to myself, might be more closely connected with the special work of a gas engineer than are some of the illustrations I shall have to lay before you. Unfortunately, during the past few weeks the leisure I had anticipated has shrunk out of existence, as there gradually accumulated on my table a pile of some hundred and fifty copies of the famous Form 4. You will, therefore, perhaps be willing to allow me to address you as members of the great army of engineers who practise "the art of directing the great sources of power in Nature for the use and convenience of man," and not as belonging to any particular regiment in that army.

Echoes still linger of the old quarrel between the professor and the practical man, between the rule of the book and the rule-of-thumb; but it is seldom that they become clamorous, except when discussion turns upon methods of education and training. No doubt, we shall always find among engineers men who regard the work of the lecture-room and the laboratory with something like contempt; and we may be very certain that we shall never lack a professor here and there with a mission for telling practical men how to manage their business, though it is well to remember in this connection that such indiscriminate combativeness as is disclosed (say) by Professor Armstrong in his recent attack on our methods, is more a personal characteristic than a professional one. The gas profession at any rate has surely buried these contentions once for all in recognizing, as it has done so magnificently, that the endowment of a professorship is the most fitting memorial to the memory of Sir George Livesey—the most practical man of you all, and certainly one of the most scientific.

These ancient feuds and distinctions have always seemed to me particularly barren, because they do not go to the root of the matter. In every branch of the engineering profession—in fact, in every field of industry—the distinction is not between the man whom circumstances or inclination have placed in the lecture-room or the laboratory and the man who similarly finds himself in the manager's office or the engineer's shanty. It is between the man who tackles his job, whatever it may be, in the scientific spirit (alive to the freshness and interest of the problems that continually face him) and the man who accepts the routine of his work with no wider outlook than that of the labourer who sees each morning so many yards of trench to be excavated.

In every art and in every science the spirit of inquiry, of research, is the one essential condition of advance. Without it, the old routine, sufficient in its time, lingers on to find itself helpless in the face of fresh demands and of new conditions. There has never been any lack of this spirit in the engineering profession. The spread of organized research, the growth of technical education, the development of highly skilled specialization are the product of the greater pace at which we live, of the more insistent demands of the community we serve; but they are manifestations of the same spirit as that which inspired the pioneers of the past. We are sometimes asked to believe that the order of the past was the mere rule-of-thumb, and that in these later

days a new and scientific race of engineers had set themselves with experimental engine and testing machine to create a new heaven and a new earth. But the laboratory is the servant of the real engineer, and not his master. No one can view the triumphs of earlier generations of engineers without recognizing that experiment and induction were ever present with them, that reason of the highest order was continually brought to bear on their designs, and that we in our day will do well to follow their lead in preparing new methods of attack for new problems.

The engineering profession, however—justly proud of its achievements in the application of science—is sometimes forgetful of the debt that it owes to the pure scientist, to the man (be he mathematician, or chemist, or physicist) whose search after knowledge has been prompted by the pure love of it, and who perhaps has hardly given a thought to the practical application of his results. There are many men "who spurn soft delights and live laborious days," and for no great reward, in the pursuit of knowledge, and who find complete satisfaction in the pursuit. Man does not live by the satisfaction of his material needs alone; there are other promptings, spiritual, rational, and emotional, to which he does well to give heed. The intellectual traditions of the Ancient Universities have in a peculiar degree fostered the search after knowledge, even when the limitations of their position and constitution have hampered the expression of it; and it is for this reason that it may be not uninteresting, not uninstructive, on such an occasion as this to ask you to consider in what degree these researches may be found to justify themselves to us by their practical application.

For consider where we are. It was in Cambridge that Newton developed his famous Laws of Motion, on which has rested the whole structure of Applied Mechanics as we know it, and established the principle of order in the physical universe by proving that the planets in their courses conform to the same dynamical compulsion as does the stone that is dropped from the hand. It was in Cambridge, in this very College, that just one hundred years ago Thomas Young recast the whole of our conceptions of the nature of light, by completing the proof of the now accepted theory that the passage of light consists in the transmission of a pulse or a wave through the all-pervading ether. It was, without doubt, in the pond which you can see from the windows of this room that he carried out those experiments in the interference of waves in water which led him to the explanation of many of the most beautiful and delicate of optical phenomena. It was in Cambridge that Clerk Maxwell developed the mathematical theory of electricity—laying, in conjunction with Faraday, a foundation on which all future work has been built. Lord Kelvin, though his life-work was carried on in Glasgow, dated from Cambridge the earliest of that remarkable series of scientific papers which marked his conquering advance through so many wide regions of the theory of heat, of electricity, and of hydrodynamics. It is here and now that Sir Joseph Thomson is carrying out those researches into the ultimate constitution of matter which promise in the long run to give a fresh key to every sort of problem connected with gases and vapours.

These men, of course, are men of genius. Cambridge makes no claim to any monopoly in such men; but it does claim that in the realms of mathematical and physical science it has contributed to the growth of knowledge in larger measure than any other centre of study and research. And that is why this seems to me an appropriate place to consider whether this piling-up of knowledge, this search after truth for its own sake, has any bearing on the practical rules and principles which come to the hand of all of us whose work it is, in whatever department, to share in supplying the common everyday needs of the world.

It is well to recognize that men such as I have named do not ask for justification at our hands. In his Presidential Address to the Mathematical Section of the British Association at Sheffield only a week or two ago, Professor Hobson laid emphasis on this, and claimed that the pursuit of the highest developments of mathematical reasoning is an end in itself. "The prejudice," he says, "that Pure Mathematics has its sole *raison d'être* in its function of providing useful tools for application in the physical sciences, is by no means extinct." And in urging some grounds of justification for the expenditure of time and energy on the abstract problems of Pure Mathematics, he goes on: "The fact that abstract mathematical thinking is one of the normal forms of activity of the human mind—a fact which the general history of thought fully establishes—will appeal to some minds as a ground of decisive weight. A great department of human thought must have its own inner life, however transcendent may be the importance of its relations to the outside. No department of science, least of all one requiring so high a degree of mental concentration as Mathematics, can be developed entirely, or even mainly, with a view to applications outside its own range." And this plea we must accept; the pure mathematician, like the musician, the painter, or the poet, is an artist, and the subject of his art is the intangible and the abstract.

It must not be imagined, however, that the mathematician either overlooks or despises the acknowledged fact that his aid has been in the past, as it will be in the future, indispensable to the progress of the arts, and in particular to those arts which mainly concern the engineer. Indeed, as Professor Hobson points out, the field of application is widening; and mathematical methods are being forced into the service of Chemistry, of Biology, and of Economics. And what I wish to do to-day is to call your attention to one or two special problems, which I have chosen as much for their intrinsic interest as for their value as illustrations, and to point out that in each the important step in advance was determined by the fact that the pure mathematician had furnished the necessary apparatus for investigating, in general terms, what had become too complicated for the unaided exercise of the faculties of observation and deduction.

Let us look then at one or two instances of what mathematics has done for us. One of the most striking developments of modern engineering is the advance that has been made the last 20 or 30 years in the design of ships. Formerly a shipbuilder could forecast from a wide experience what power he must supply in order to drive a ship of known type at a required speed. In dealing with a ship which diverged widely in size or in design from known types, his estimate of the relation between speed and power was often little better than trained guesswork. Now-a-days, by means of experiments on models, he knows before he sends his plans to the ship-yard exactly what power he must supply; and he can make with confidence a close prediction of the vessel's performance. Now the validity of the argument from a model to a full-sized ship depends on a purely abstract course of reasoning on the dynamical behaviour of similar systems moving in similar circumstances and acted on by corresponding forces. The shipbuilder who makes the model and experiments on it, has no need to know, and probably does not know, this course of reasoning; but it forms, nevertheless, the foundation and justification of his method.

In this particular problem, indeed, theory is still ahead of practice. More than 30 years ago, Osborne Reynolds showed that by means of models large enough to be used as launches, and supplied with the proper power, exact determination of the manœuvring qualities of the full-sized vessel could be made. Thus if a model of a battleship were made on a scale of (say) one-twentieth, and were supplied with power in the ratio of the cube of the linear dimensions—that is on a twentieth scale, with one eight-thousandth of the power of the ship, the manœuvring qualities of the ship and the model would, as to distance, be in proportion to their lengths and as to time would be as the square root of their lengths. Thus if the model, driven by, let us say, 4 H.P., with a certain angle of rudder, were able to turn through a certain angle, say, in 20 yards, then the full-sized ship with engines developing 32,000 H.P. and with the same amount of rudder would turn through the same angle in 400 yards. And if the evolution in the case of the launch occupied 10 seconds, then the time taken by the ship for the corresponding evolution, being proportional to the square root of the length, would be about 45 seconds. An example such as this, when reduced to actual numbers, shows how powerful an experimental method has been put at our disposal by the pure mathematician.

The construction of big guns supplies another useful example. Suppose we take a hollow circular cylinder, with thick walls, and closed ends, and apply a heavy internal pressure, tending to burst it. The distribution of stress in the metal of the walls, diminishing from the inner surface to the outer, can only be determined by solving a differential equation embodying the fundamental laws of elasticity. It was a common experience of the early makers of guns that it was easy to reach the bursting pressure; and they hit on the device of shrinking on hoops. The effect of this, though certainly it was not clearly recognized, was that the tube itself was set up as it were in compression; so that when subjected to the heavy internal pressure, the metal had a good deal of compressive stress to run off, as it were, before it felt the pull of the bursting tension. The problem of shrunk-on hoops, or of an outer cylinder shrunk-on the whole length of the inner, could be dealt with by an extension of the mathematical argument applied to the simpler case; and the analysis has been extended to the case of winding on wire under tension, by which means the same effect is now obtained.

Take another illustration of the practical value of mathematics. Consider the motion of the heavy trunk-piston of a large gas-engine running at several hundred revolutions per minute. About the middle of its stroke, we have a body weighing, it may be, several hundredweight, and travelling at a speed of something like 20 feet per second. In less than one-fifth of a second, you find this heavy body travelling at the same speed, but in the opposite direction. It requires the exercise of a very large force to reverse so great an amount of motion in so short a time; as would be very apparent if we allowed the piston to leave the cylinder and attacked it on emergence with some sort of gigantic cricket bat. And the force which has to be applied to the piston, whether it is supplied by the energy of the explosion or by the energy of the fly-wheel, must have a kick-off against something, and that something is ultimately the bed to which the engine is bolted down. And if at one end of the stroke the pull on the engine-bed is in one direction, then at the other end of the stroke the bed will experience an equal pull in the opposite direction. If no provision is made to meet these forces, the engine-frame will be racked and pushed and pulled until it is either shaken to pieces or is torn from its bed. In the case of a locomotive running at high speed, these forces, if unbalanced, will affect both its grip on the rails and its draw-bar pull; and if the engine has the usual arrangement of two cranks set at right angles to one another, there will also be couples tending to sway the engine alternately to right and to left in a horizontal plane.

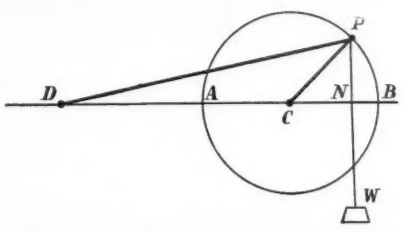
The problem of balancing the disturbing forces which arise in running machinery, was not of very great importance in the slow-running movers of the mill-engine type; but it became a

pressing one when the need arose for high speeds, in order to get high powers developed in small bulk—particularly for torpedo boats, for electric light plants, and for express locomotives. The forces we are considering increase in proportion to the square of the speed; so that in an engine running at 400 revolutions per minute they will be twenty-five times as great as in an engine, with the same weight of piston, running at only eighty revolutions per minute. In this case, the engineer had no time to wait for the mathematician to come to his aid. The mechanical principles underlying the problem were sufficiently well understood to suggest that if at any one instant one part of an engine were exerting a force tending to thrust the engine in one direction, it would be well to provide that some other part should at the same instant be arranged to give rise to a force tending in the opposite direction. Many costly experiments were made, and with considerable success, before the problem became the subject of any very thorough analytical investigation; and even then many weary pages of mathematical reasoning were devoted to particular cases which, in the nature of things, were never likely to arise. But it is now possible to say, with some assurance, what can be done in the way of balancing and what cannot be done, and in what direction to seek the best compromise between such disturbances as cannot be overcome.

Now this problem, as such, has probably never claimed the attention of any professed mathematician. It has been tackled by the humbler folk whose work it is to apply to such questions the weapons they find to their hand; but it is none the less true that it is the labour of the pure theorist that has made possible even an approximate general solution of the question.

The mathematical investigation of the motion of systems in vibration affords one of the most beautiful examples of the application of analysis. In the case of simple systems—such as the spring of a steam-engine indicator, or the elastic suspension of a galvanometer—the equations which arise are not in themselves of great complexity; but their correct interpretation requires some power of handling and applying general results. In an ordinary indicator, the pressure of the steam or of the exploding gas pushes up the indicator piston, with its pencil gear attached, against the resistance of the spring. When the pressure rises slowly, it will at any instant just balance the resisting thrust of the spring; and the pencil will give a correct record. But the ordinary indicator piston, small though it be, cannot take up its motion instantaneously; so that when the pressure rises very rapidly, its thrust no longer balances the thrust of the spring, but is partly occupied in getting the piston and its gear into motion. Thus at the beginning of the trace on the indicator card, we shall find the pencil record lagging behind the actual pressure which we are trying to measure. Now an indicator piston and spring if suddenly jerked into motion and left to themselves, would go on vibrating; and this same vibration will persist in the circumstances we are considering. Thus the pencil record, instead of showing a smooth line of rapidly rising pressure, will appear as a wavy line first below, then above, and then again below the correct pressure-line, and so on.

Oscillations set up in this way generally persist during expansion; and they are, of course, quite familiar to anyone who has examined high-speed diagrams taken with an ordinary steam-engine indicator. These oscillations are set up by the sudden rise of pressure, and whether they will persist along the expansion line or not depends on the position and velocity of the piston at the instant the pressure rise is checked. Professor Hopkinson, in his pamphlet on vibrations, points out that slight changes in the strength of the mixture used in a gas-engine may affect the rise of pressure sufficiently to convert a wavy diagram into a comparatively smooth one.



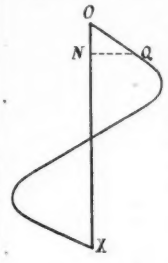
The investigation of motions of vibration opens up a wide field, in which no advance can be made without recourse to mathematics. I will venture to trespass on your patience with a further example. The simplest form of vibration is what is called simple harmonic motion. Imagine a string PW hanging vertically from an overhung crank-pin P, and so weighted that it remains vertical as the crank rotates. This it will only do if the speed of revolution of the crank is kept low; but for the purposes of our definition any speed will do, so long as it is kept constant. When this is so, the horizontal motion of the string, which is the same thing as the motion of the point N across the diameter A B, is what is called simple harmonic motion. The point N oscillates between A and B, making one complete travel of its path, back and forward, in the time which the crank takes to make one revolution. This time is called the period, or the periodic time, of the motion. All its circumstances as to displacement and acceleration are simple, and easily decided from the uniform circular motion of the pin P.

Now attach to the crank-pin a connecting rod P D, and let the crosshead D oscillate in the line of stroke. The motion of D will in many respects resemble that of the point N. The length of its path will be the same, and it will stop and turn when N stops and turns—that is, at the dead-centres. But the two motions are not identical. At the dead-centres, the distance between D and N is just the length of the connecting-rod; but in any intermediate position, as appears at once from the figure, it is something less than the length of the connecting rod. And the difference between the two motions thus appears as a small quantity which goes through its complete range of values twice in each revolution of the crank. For the purposes of rough approximation, the motion of the crosshead is taken as identical with the motion of N, and the longer the connecting-rod the nearer this is to the truth. But in many problems—especially those connected with the balancing of engines—this approximation is not close enough. Some account has to be taken of the difference we have just been discussing; and this is most simply represented by assuming this difference follows a similar harmonic law, with the important difference that its period is just half that of the principal motion. This represents very closely what we have described; and it is expressed by saying that the motion of the crosshead is the sum of two simple harmonic motions. For one of these motions the range is the stroke of the engine, and the period is the duration of one revolution; and for the other the range is something much smaller, and the period is half the duration of one revolution. From this combination of motions, the circumstances as to velocity and acceleration of the piston can be easily deduced in a form to which the equations of motion can be readily applied.

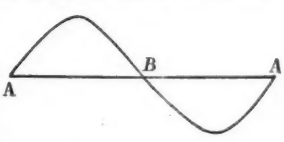
The motion of the crosshead, in such a case as this, can also be investigated by graphical methods of great simplicity and beauty; and as the constructions involved are rigid and not approximate, the accuracy of the results depends only on the scale of the drawing and the skill of the draughtsman. But when the forces under discussion arise from the motion of several cranks attached to one shaft, the graphical methods become cumbersome; and for any general deductions we are forced back on analysis, which is made possible by the breaking-up of the motion as I have described it. I have dealt with this case, however, not because the motion of reciprocating pistons is in itself an important subject of investigation, but because it furnishes for my present purpose a familiar example of the general analysis of periodic quantities. It is, in fact, a particular application of perhaps the most powerful weapon with which the mathematician has furnished the world of physics and engineering.

I should like to try, before we leave the mathematical portion of my paper, to give you some idea, in language as non-mathematical as I can find, of what is meant by Fourier's analysis of Periodic Functions.

A periodic quantity is one which in a certain definite period of time goes through a definite sequence of values, coming back to the value it started with, and which in the next equal period of time, and in each succeeding equal period, repeats the same sequence in the same order. This sounds somewhat formal and long-winded; but you must forgive a little precision here and there. The simplest example of a periodic quantity is the harmonic displacement of the point N, which we have been discussing. Let us draw a vertical line O X, and take distances along it measured down from O to represent intervals of time measured from the instant when the crank C P is vertical. Thus I take the length O X to represent a whole period, and O N, which is one-eighth of O X, to represent one-eighth of a period, and the length of the line N Q is the corresponding length of C N when the crank has moved through one-eighth of a revolution. Setting-off these distances corresponding to equal steps round the complete circle, we get the curve as drawn, which is the displacement curve for simple harmonic motion drawn on a time-base, and is what is called a simple sine-curve.

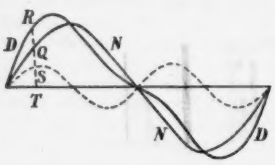


Any periodic quantity, if it follow the simple harmonic law—be it a velocity, an angle, an electromotive force, a temperature, or what you will—can have its fluctuation represented to a time-base by a curve identical with this one. The velocity of the point N, for instance, starts at zero at the left-hand dead-centre, passes through its greatest value when N passes over C, comes to zero, and is reversed at dead-centre B; and, taking for convenience our time-base horizontal, we have its periodic curve as in the figure, again a simple sine-curve. You will notice that our starting-point is now the dead-centre A, and not the mid-position as in our displacement curve.



What now about the velocity of the crosshead D? This moves as we have seen in a periodic manner. But its motion is not a simple harmonic motion; and we can easily see that it must move faster than N at first when the distance D N is diminishing, and slower than N when D N is lengthening out again. If we determine this velocity, as we can do, and represent it on the same time-base as the velocity of N, we shall find the trace as shown in the curve marked D; the curve marked N being the sine-curve representing the velocity of N. These curves cross exactly at the quarter-points—that is, at the dead-centres, and when the crank is vertical. At any particular instant (represented by the point T)

the instantaneous velocities of N and D are respectively T R and T Q, and the difference is Q R. Set-off now a distance T S, equal to this difference Q R, and do the same all along the curve—thus plotting a curve whose height at any point represents the difference between the two velocities. This difference curve, shown in dotted lines, is found to be very close to a simple sine-curve, which, however (and this is the important point), goes through two complete fluctuations in one original period.



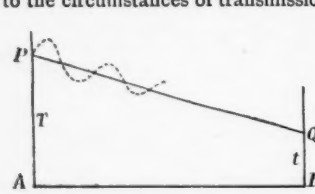
Now Fourier's great theorem, as applied to cases such as we are considering, is that any periodic quantity, however irregular the outline of the curve which represents it, can be dissected into a series of simple harmonic quantities, each represented by its own simple sine-curve, and each having a period which is some simple fraction ($\frac{1}{2}$, $\frac{1}{3}$, and so on) of the complete period in which the original quantity carries out its complete fluctuation. And the theorem also shows how to determine the relative importance, as to magnitude, of the different harmonic terms whose sum goes to make up the quantity in question.

It is not too much to say that wide fields of accurate knowledge, and knowledge of a practical kind, in mechanics, in heat, and above all perhaps in electricity, must have remained closed to our attack but for the power of this particular method of analyzing periodic quantities. Among its greatest triumphs is the analysis of the tides, which showed the way to the construction of the tide-predicting machine, in which the fluctuations of all the various causes which influence the periodic rise and fall of the tides are properly taken into account.

There is another important class of fluctuating quantities at which I should like to glance very briefly. If a pendulum be set swinging, and left to itself without the power of the spring or weight to keep it going, it will gradually be brought to rest by the friction of the air. A galvanometer needle set swinging by the passage of a quantity of electricity through the coils of the instrument, will continue to swing backwards and forwards for some time; its angle of swing gradually diminishing according to a definite law. In these cases, the frictional resistance which gradually extinguishes the motion is usually proportional to the velocity of the motion at each instant; and when that is so the law according to which the gradual slowing-down takes place can be accurately investigated. A somewhat similar problem, depending on quite different physical circumstances, but involving analysis of the same general nature, relates to the gradual wiping-out of periodical variations of temperature applied to the surface of a body. There is, for instance, at the surface of the earth a fluctuation of temperature of which the period is one year, as well as a fluctuation of which the period is twenty-four hours. Temperature records have been taken at different depths below the surface of the earth; and these records show exactly what the theory of transmission of heat accounts for. In such a case, naturally, if the records do not agree with the theory, so much the worse for the theory. It is found, for instance, that the more rapid fluctuation (the daily one) penetrates to a slight depth only, while the fluctuation of a longer period is in evidence at a much greater depth. And according to the mathematical theory, we find that, if other things are the same, the depths at which the fluctuations of temperature become so small as to be unrecognizable are proportional to the square root of the period of the fluctuation. The ratio of the periods in question is 365 to 1; and the ratio of their square roots is about 19 to 1. So that if the daily fluctuation just died out at a depth of a foot, we should expect to find the annual fluctuation just recognizable at a depth of about 20 feet. And although the actual depths mentioned are chosen simply for convenience, this is about the relative depths to which the two influences are able to pierce.

Another feature, also in agreement with and predicted by theory, is that the fluctuations are not only quickly reduced in vigour as we descend, but they are retarded in time. Thus, in the experiments I have referred to, it was found that 3 feet below the surface the range of temperature from one year's end to the other was about 16°, and the temperature was highest about the middle of August; whereas at a depth of 24 feet the range was rather less than 4°, and the highest temperature occurred early in November.

The mathematical investigation of this problem applies equally to the circumstances of transmission of heat through the walls of an engine cylinder. In considering the question of the condensation on the walls of a steam-engine cylinder, and the question of the passage of heat through the walls of a gas-engine cylinder, the nature of what is called the temperature gradient just below the inside skin of the cylinder is an important practical matter. Take the case of a gas-engine cylinder, and assume that the outer surface is kept at a constant and moderately low temperature by the water circulation. Let us call this temperature t, and at first suppose that the inside walls are kept at a constant and higher temperature, which we shall call T. The temperature gradient through the metal will then be a straight line—that is to say, the drop from T to t will take place uniformly through the thickness of the walls. If A B in our figure represents the thickness of the walls, then the temperature line is the straight line P Q, where A P represents the temperature T and B Q the temperature t.



Now let us suppose, as being more in accord with facts, that the temperature on the inner face is a fluctuating one, and assume that its fluctuation is a simple harmonic one, and that T is its mean value, it goes (say) up to $T + \theta$ and down to $T - \theta$. This pulse or wave of temperature is transmitted into the metal; and as I have just pointed out the equation of transmission of heat can be formed and the circumstances at any depth completely determined. The result, of course, depends on several factors—the density of the metal, its conductivity, and its specific heat on the one hand and the frequency of the surface fluctuations on the other. We find that we can represent the distribution of temperature at any instant by superposing a wavy line of the straight gradient which we have drawn, and that the height of the waves of temperature falls rapidly as we penetrate into the metal. This is represented in a general way by the wavy dotted line which is drawn from the instant at which the surface temperature is just at its mean value T.

If we take cast iron as the metal of our cylinder, and one-fifth of a second as the period of fluctuation (which corresponds to an engine speed of 300 revolutions per minute), we find that at a depth of three-sixteenths of an inch the extreme range above or below the steady gradient temperature is about one two-hundred-and-fiftieth of the range at the surface—that is to say, at this very small distance from the surface the fluctuation is practically wiped out. We also find that the wave-length measured into the metal is about one-fortieth of an inch.

The general equations of the flow of heat, on which the solution of the problem depends, are also applicable to other problems. Exactly the same equations are used in handling the problem of the transmission of signals through a submarine cable. I mention this as an example of what constantly occurs in the application of mathematics to practical problems. The form of analysis required by one set of circumstances in one field of science is found to fit a totally different set of circumstances in some distinct, and it may be, remote region.

The examples I have discussed may serve to indicate how in one particular field the work of the pure scientist—in our case the mathematician—is brought to bear practical fruit. And the same general relation holds good in other departments. The pure scientist, searching after wide generalizations, and pushing further and further the limits of knowledge, discovers new modes of attack, new relationships between unconnected facts, new bases for further advance. We, in dealing with the applications of science to practical needs, make free use of whatever in his methods or results seems likely to assist us in solving our own particular problem.

This division of labour has great advantages. In any practical problem of even moderate complexity there are present factors of widely varying degrees of importance. Any attempt at a general solution of the problem will give equal prominence to all these factors, and will probably give no indication of their ultimate relative values. And any attempt to simplify the analysis may involve the neglect of terms which, though analytically objectionable, are practically important. But the practical man knows which factors are important and which are unimportant; and often by a wise neglect, which may scandalize his more learned brother, he can reduce the problem to a form from which practical results of value can be obtained.

In passing from this part of my subject, I have but to express the hope that the examples I have dealt with may be sufficient to show that engineering practice owes a very real debt to pure theory, and that the mathematician, though his purpose is not our purpose and his thoughts not our thoughts, may still be recognized and welcomed as an ally.

In other fields of research (as for instance in Physics or Chemistry) we find a much more direct and obvious relation between the work of the pure scientist and that of the practical man. Both deal with the tangible and the concrete, both express themselves in the same language, and use, with some reservations, the same methods and units of measurement. Many researches of real scientific value and importance have had their beginning in some question suggested by a practical need, and more than a few scientists, starting on some track of pure investigation, have found it lead them to a definite practical result of immediate application.

Some pure scientists we know and many engineers; but when we try to place men like Lord Kelvin, or William Siemens, or John Hopkinson in one class or the other, we see that any suggested line of demarcation must be vague and shifting. In many branches of engineering, there is much close co-operation between research and practice; and as instances of this I may mention the work done by bodies like the British Standards Committee or the Gas Explosions Committee of the British Association. And in order to illustrate one or two important aspects of the co-operation between theory and practice on the physical side, I propose to occupy a few minutes of your time with some considerations relating to the Theory of Heat.

We are all of us interested—some no doubt more directly than others—in the application of the great natural stores of energy to the production of directed and controlled mechanical work, and more particularly in the utilization of the energy which is stored

in coal. If we compare for a moment the various forms in which energy is found, or in which we can store or transmit it, we find some curious results. As a unit of comparison let us take the horse-power-hour—that is, the work done in an hour by an agent working at the rate of one-horse power, or, what is the same thing, by a 60 H.P. agent working for one minute. If we wish to store this energy in water with a free available fall of (say) 100 feet, about 9 tons of water are required. A waggon weighing about 7½ tons possesses this amount of kinetic energy when it is running at 60 miles an hour. Everyone carries a small store of energy in a coiled-up watch-spring. To store one-horse-power-hour in steel springs, without overstraining the metal, would require something over 60 tons of steel. If we expend this amount of energy in raising the temperature of water, it is only enough to raise the temperature of 10 gallons about 25° Fahr. But if we supply the proper amount of oxygen to 1 lb. of good coal, so that it is completely burnt, it will develop heat sufficient to raise six times this amount of water through the same rise of temperature. If, therefore, we wish to try our energy in the least bulky form, we shall not seek to acquire rights over a waterfall, but will put our money into coal.

On the other hand, if the energy is required for any form of mechanical work, we shall at once recognize that the energy in our coal presents itself in a much less handy form than does the energy of a head of water, or a wound-up spring, or a cylinder of compressed air. The energy locked up in the chemical arrangement of the coal and the oxygen must first be developed in the form of heat; and in this form its only impulse is to spread itself about, to run off to regions of low temperature, and thus to lose all its availability for ultimately producing mechanical work. In comparing energy in the form of heat and energy stored in a head of water, or in a spring, or in compressed air, Reynolds has used a rather striking analogy. He likens the former to the energy of a mob; the latter to that of a disciplined army. Consider an agitated mob of (say) a thousand men, rushing aimlessly hither and thither, each individual possessing a definite amount of kinetic energy in virtue of his motion, but the crowd as a whole having no common tendency except to melt away in all directions. Contrast it with an equal number of men, each having the same amount of energy as before, but all moving in disciplined order in a definite direction. The one is a directed and effective source of power, the other is not. The energy of heat then, notwithstanding the enormous advantage it has in bulk, starts out to supply mechanical work under a very definite handicap.

The combination of boiler and steam-engine (the typical agent for the conversion of heat into mechanical work) had reached a very advanced stage of development before it was recognized that the disproportion between the energy of the fuel and the useful output of the engine was in great measure inevitable. There is a form of observation, not so often employed in laboratories as it might be, which for brevity we may call the statistical. It consists in fencing-off some particular object of observation, and taking count of what goes in and what comes out. The typical observer in this manner is the man who having been told off to report on a refrigerating plant summarized his observations by saying that coal went in and ice came out. His report did not contain all that might have been said, but it did single out a very significant fact. Let us build our imaginary fence round a steam-plant, consisting of boiler, engine, and surface condenser. We must leave openings for the supply of coal, air, boiler feed, and circulating water, and we must supply exits for the furnace gases, the ashes, the air-pump discharge, the circulating water after it has passed through the condenser, and the engine-belt which delivers the useful work.

Now, when everything has reached a steady state, we have to form a balance-sheet and compare what goes in with what comes out. We shall have several accounts to balance. In the first place, we shall find that we can set off the weight of the entering coal and air against the weight of the ashes and the chimney discharge; and we shall find the circulating water the same in amount at exit as at entry, and the air-pump discharge will balance the boiler feed if we assume that all glands and joints are steam-tight. These several items make up a complete balance so far as matter is concerned. Then as regards energy, on one side of the account we have the energy which the coal and its proper amount of oxygen, entering in the air, are able to develop in combustion; and on the other side we have the energy represented by the rise of temperature of our two streams of water and of the stream of coal and air which goes in cold and comes out, at the chimney top, warm, and the energy which is delivered by the belt, which we suppose measured on some form of dynamometer. To take very rough and round figures, we shall find that of the energy supplied in the fuel about one-quarter goes up the chimney, about one-tenth is delivered by the belt, while the remainder—that is roughly two-thirds—is represented by the rise in temperature of our streams of water. Of these streams, the circulating water carries off probably from fifteen to twenty times as much as the air-pump discharge.

In a gas-engine we may develop about one-third of the thermal energy of the gas; the remainder going into the exhaust-pipe or to the circulating water. But, on the other hand, the thermal energy of the gas is very much less than that of the coal from which it is formed.

Probably the most favourable conditions for economy in a steam-plant considered as a whole exists on board ship. With everything in their favour, the best of large marine engines deliver to the shaft perhaps 15 per cent. of the energy fed through the stoke-hold. Something about 20 or 25 per cent. goes up the smoke-stack; and the rest—say, 60 per cent.—is pumped into the sea in the circulating water. The 15 per cent. delivered to the shaft also ultimately reaches the sea; for it is spent in overcoming the resistance of the water to the motion of the ship, and is dissipated in the heat of skin-friction.

The old theory was that heat was something indestructible, which could do work when passed down the scale of temperature—much as water or other heavy matter can do work when passed down the scale of height; and that a heat-engine was a contrivance for so arranging the descent of the heat as to make possible the useful mechanical application of the work done by it. The development of the steam-engine probably suffered little from the bad theory at its back, partly because limitations imposed by the nature of materials make the theoretical efficiency an unattainable ideal, and partly because James Watt, by what may be called sheer engineering instinct, had grasped what experience has shown to be the essentials of the problem. Nevertheless, when it was recognized that the heat given out by a working substance is less than that taken in by it, by an amount exactly equal to the mechanical work it has done, the working substance being returned to its original state, a fresh impulse, and a very fruitful one, was given to the whole problem of the utilization of the energy of our natural stores of fuel.

The science of thermodynamics, as based on the actual relation between thermal and other forms of energy, was developed with extraordinary rapidity about sixty years ago, mainly by Clausius, Rankine, and Kelvin; and the general conclusions which they formulated have since then become an integral part of all modern theory in physics and chemistry. The laws which they established have been of great direct value in such problems as the flow of gases and vapours; and through them the development of the steam-turbine has been much less of an empirical advance than is generally supposed. But it has to be admitted that they do not give us anything which might be called a complete theory of all the very complicated actions which go on, for instance, in a steam-engine cylinder. The laws of thermodynamics in some degree stand apart, almost remote, from actual operations—indicating a theoretical perfection of which the most efficient engine must fall lamentably short. And I think the tendency to throw general theory into a mathematical form has something to do with this apparent remoteness.

We are assured, and the logical completeness of the proof is remarkable while the validity of the experience on which it rests is unquestioned—we are assured that when our source of power is a thermal one, we must draw on it for very much more than we can hope to convert to our use. We also know that the inevitable waste of energy bears the same proportion to the supply as the absolute temperature at which the working substance leaves our engine bears to the temperature at which it enters it. But we are not definitely told what it is in the nature of things which necessitates this limit on our powers of exchange. I wish in closing merely to indicate one or two considerations on this point.

In the first place, we know that if we can get heat from our source into our working substance it will give it just those powers of expansion and of thrust which will enable us to overcome some external mechanical resistance; and we also know that, other things being equal, this elastic thrust is greater the higher the temperature. This means that we have to prepare our working substance, get it as near as we can to the temperature of our source, before we can economically pass the heat into it; and this entails the expenditure of work. Then again as the working substance expands, doing the useful work required of it, it falls in temperature, and quickly reaches a state in which it can no longer exert useful thrust. Then we have to get rid of it; and this usually entails throwing away a large amount of the energy supplied. We cannot, for instance, pump low-pressure steam, as from an engine-exhaust, back into the boiler, against the high-pressure existing there, without condensing it and thus losing a vast amount of the energy it still retains. In short, a heat-engine is not like a gun. It has got to bring its bullet back again and load itself for the next shot; the man at the trigger supplying only the powder. Or, to take another analogy, the effective value of a working substance must be reckoned on the same basis as the earning capacity of a coal-waggon, in which the trip back to the mine has to be set off against the trip out.

In all processes concerned with the transformation or application or transmission of energy or power, one simple law stands supreme. No energy is destroyed. A little is delivered; much is wasted. And the engineer who, by thought and observation, enables his fellows to transfer one per cent. from the column headed "waste" to the column headed "delivered," is fulfilling the highest aims of his profession.

The Autumn General Meeting of the Midland Association of Gas Managers will be held at the Grand Hotel, Birmingham, on Thursday, the 27th prox.

In the mining and chemical industries groups in the restored British Section at the Brussels International Exhibition, the Glenboig Union Fire-Clay Company have an exhibit which is practically identical with the one in the old section; and the Gaslight and Coke and the South Metropolitan Gas Companies show chemical products.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The opening meeting for the session of the Eastern District Division of the Scottish Junior Gas Association was held in the Heriot-Watt College, Edinburgh, on Saturday afternoon. There was a very good attendance; and Mr. H. RULE, of Kelty, the retiring President, expressed satisfaction at seeing so large a number of members. He remarked that as the years went on it was gratifying to know that the demand for gas was rapidly increasing, and that there was a bright future for the gas industry. It was the duty of all those who were engaged in the gas profession to stimulate the demand, and direct all their energies towards this end. The time had now come when he must quit the presidential chair; and he had much pleasure in asking Mr. Dunlop, the new President, to take his place. He was sure that Mr. Dunlop was well fitted for the position; and if the members would extend to him the hearty co-operation and support they had given to past Presidents, the session they were entering upon would be the most interesting and successful the Association had had.

Mr. W. DUNLOP (Kirkcaldy), the new President, on taking the chair, said his first duty was the pleasant one of presenting the Association medal to the Past-President. Mr. Rule had been an active member, an energetic Secretary, and a popular President.

Mr. RULE briefly returned thanks for the gift.

PRESIDENTIAL ADDRESS.

The PRESIDENT, in the course of his address, said: Since our inception, seven years ago, the sessions have proved most successful; and I sincerely hope that the one we are just entering on will prove as successful as the preceding ones. On comparing the membership at present with previous years, I find that there has been a slight falling off—due principally, I think, to some members obtaining posts in other districts, and the failure of their successors to take advantage of the benefits which membership in our Association would afford them.

It occurs to me, in looking over records of the various Junior Associations, that the chemical side of our industry has scarcely got the attention from juniors that it justly deserves. By the chemical side of our industry, I mean the ascertainment by chemical tests of the efficiency of each part of our plant. In every-day routine, we are apt to forget that our modern appliances are the result of careful study of the chemical properties of the materials involved; and as we are changing our methods, it necessarily follows that a system of testing must be kept up. When we consider how much a chemical process the manufacture of gas is in a modern works, and the number of ways in which chemistry can be brought in to help us, it is rather surprising that so little testing is done, even in medium-sized works. A simple test for sulphur in a coal will sometimes suffice to condemn it, and thus save the necessity of making further tests as to the yield per ton, &c. It is not sufficient to test our coal when the contracts are made—it should be periodically tested, so as to see that the quality is being maintained.

Some time ago, I made a series of tests on a "Walker" washer, to ascertain under what conditions the greatest efficiency could be obtained from this part of the plant; and, as a result of my tests, I found that, by increasing the rate of flow of the liquor through the washer, greater efficiency in respect of the elimination of sulphuretted hydrogen was obtained, while carbonic acid was at least equally well eliminated. One reason for the more efficient results may be that, by having a good flow of liquor passing through the washer, there would be less chance of gas getting through the upper chambers without having come into immediate contact with the washing liquor than if only a slight flow was passing. When I made the first test, the liquor was passing through the washer at the rate of 10 gallons per hour; and in the subsequent tests, I increased the rate until it reached 50 gallons per hour. I aimed at having the conditions as nearly as possible the same in all cases; the rate of flow of the liquor alone being changed. That is to say, I made a test with the low rate of flow; and when I again found that the temperature of the liquor, the temperature of the gas, the make per hour, as well as the percentage of impurities in the gas, were about the same, I altered the rate of flow and made another test. In the subjoined table, each result is the average of three determinations in the case of each rate of flow.

Tests at Inlet and Outlet of Washer.

Inlet.			Outlet.			Eliminated.			Rate of Flow. Gls.	Liquor. Inlet.	Deg. Twad. Outlet.
Grs. H_2S.	Grs. S.	Percentage of CO_2.	Grs. H_2S.	Grs. S.	Percentage of CO_2.	Grs. H_2S.	Grs. S.	CO_2.			
510·0	480	3·5	453·7	430	3·1	56·3	50	0·4	10	4·3	10
503·6	474	3·2	444·4	418	2·9	59·2	56	0·3	20	4·5	8·8
520·6	490	3·4	455·8	429	3·0	64·8	61	0·4	30	4·5	7·5
495·2	466	2·9	421·8	397	2·5	73·4	69	0·4	40	4·5	6·4
534·4	503	3·1	449·4	423	2·8	85 0	80	0·3	50	4·25	5·8
505·7	476	2·6	413·3	389	2·2	92·4	87	0·4	55	4·5	5·5

In working the washer, the liquor is pumped from the stock-tank to a tank immediately above it, from which it flows down through the washer and back to the stock-tank. It will be noted that, though the Twaddel of the liquor in the bottom chamber was reduced from 10° to 5·5° Twaddel through the increased flow, the strength of the stock liquor was maintained.

In these days of rush, it is not often that a year passes in a gas-works without some alteration or addition to the plant taking place; and it becomes all the more necessary, therefore, that we should have an intimate knowledge of what is taking place in our works, and what effect any contemplated alteration or addition may have on the already existing plant.

Say a tar-extractor has to be put up, let us consider for a moment what effect this is likely to have. The gas will be robbed of its tar-fog and some hydrocarbons; and, consequently, less tarry matter will go forward to the washer and scrubber, which to some extent will increase their efficiency. But other conditions will arise. It will be found that there will be an increase in the amount of carbonate of ammonia crystals in the condensers. Whether this is due to a more active combination of ammonia and carbonic acid gas, or to less aqueous vapour going forward, which would prevent the formation of crystals, I am not in a position at present to say. I am inclined to favour the latter hypothesis, however, as the crystals make their appearance most in the last three columns of the condensers. The condensers, being relieved to a great extent of the condensation of tarry matters, will be more active in bringing down aqueous vapour; and by the time the gas reaches the last three columns, there will be considerably less moisture in it, and conditions will be present most favourable for crystallization to take place. These crystals may even be found well forward in the manufacture pipe, and sometimes accumulate to such an extent on the seat of valves as to interfere with their free working. In addition to carbonate of ammonia crystals, the naphthalene will come down more readily, and instead of troubling us in the mains and services will make its presence more apparent inside the works—principally at the seal-pots of the condensers and the inlets of the holders; and this necessitates a close watch on the plant to see that no chokes take place. A slight increase in the back-pressure at the inlet of a holder usually denotes that naphthalene has collected at this point. I have found that a choke here is best cleared by first pumping the water-trap dry, and introducing a bucket of benzol, followed by enough hot water to fill the stand-pipe. The benzol floats on the surface of the water, and in its passage up the pipes dissolves the naphthalene; and it will be found, on again pumping the water-trap dry, that the stand-pipes will be perfectly clear. A periodical steaming of the condensers and manufacture pipes will do much to prevent any accumulation, and allow the gas to pass freely through the various processes.

That an Everitt tar-extractor does much to reduce the number of complaints due to choked services, cannot be gainsaid; but the figures which can be produced regarding its efficiency are very variable—ranging from a removal of 50 per cent. of the naphthalene to an actual increase. What tests I have made have shown an increase in the amount of naphthalene at the outlet. Information obtained from other places where there is an extractor of this type in operation confirms the statements I have made regarding the conditions which arise. It seems rather strange that a 50 per cent. elimination should produce increased troubles through accumulation of the substance supposed to be removed. I am inclined to think what really takes place is that naphthalene is set free from other hydrocarbons with which it has been associated, and is for this reason more liable to be deposited in the works.

While on the question of new apparatus, I would just like to mention incidentally that recently a Bryan-Donkin steam-regulator was installed at Kirkcaldy. When first started, it proved to be troublesome to regulate. The bell seemed to oscillate too freely with large variations from vacuum to pressure. A careful examination of all the working parts was made to see that no looseness existed, and that every motion of the bell was imparted to the steam throttle-valve. After all the loose parts and the connections between the bell and the steam throttle-valve had been made perfect fitting, and the air-valve on top of the outer casing carefully adjusted, a chart was obtained equal to any I have seen produced where a retort-house governor was in use. In working a regulator of this type, it is most important that the air adjustment be carefully set.

At no time in the history of our industry did the method of carbonization present so much interest to the gas profession as at present. The idea of carbonizing in vertical retorts has long been in the minds of gas engineers; and the progress made in this direction by our sister industry—the Scottish oil trade—has been keenly watched. In the early days of the oil industry, the shale was retorted in the same type of retort as was in general use in the gas-works at that time; and it was not till the year 1850, when Mr. Young took out a patent, that any special form of retort was in use for the distillation of shale. Since then, the retorting of shale has passed through an evolutionary process very similar to what has taken place in the gas industry, though the objects of the various changes have not been the same. The principal factor in the evolution of the shale-retort has been the increased yield of sulphate of ammonia; while in our own industry the factor has been increased yields of gas per ton of coal. The first mention of vertical retorts in gas making that I can find was in 1863; and this was in connection with a suggestion to produce gas for heating purposes, and supply it at a cheap rate. The proposal was frustrated by the refusal of Parliament to grant the

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necessary powers, on account of the opposition of the local gas company. Some of the advantages of the vertical retort I should say are: Less loss of gas from the opening of retort-doors, increased amount of gas produced per square foot of floor area, freedom from dust and noise, and (if the experiences of the shale-oil industry count for anything) longer life of our settings.

The question of the smoke nuisance is being much discussed by our municipal and public bodies; and it is just possible that, in the near future, Parliament may compel these bodies to take the matter seriously in hand. The inevitable result of this would be a greatly increased demand for the commodity we produce.

At the close of the address,

The PRESIDENT intimated that the next item on the programme was to have been an address by Mr. J. Falconer King, of Edinburgh; but the Secretary had received a letter from him, which would be read to the members; and seeing that Mr. King was not to be with them, the Secretary wrote to Mr. J. W. Napier, of Alloa, pointing out to him the position they were in; and Mr. Napier had kindly consented to make a few remarks upon the address, which would then be open for discussion.

The HON. SECRETARY (Mr. W. Geddes, of Granton) read Mr. King's letter, written from Tours, in which he asked whether they could not arrange to dispense with his attendance at the meeting. He said he should like very much to be present at some of their gatherings during the coming winter—not necessarily to intrude in any way, but rather to see how they were usually conducted, and to learn if he knew enough of the subjects dealt with to be able to take part in the discussions. The Hon. Secretary also announced the receipt of a telegram from Mr. Wilson, of Glasgow, expressing regret that he had been prevented from being present. This was a pity, as Mr. Wilson had taken a very deep interest in the Association ever since its inception.

Mr. J. W. NAPIER (Alloa) then addressed the members. He began with the remark that his presence there was somewhat fitting, in so far as he was essaying to fill the position which was to have been occupied by Mr. Falconer King, his old master. It was from Mr. King that he received his education in chemistry and his start in life. He wished it to be clearly understood, however, that he had not prepared any special matter, but that he simply desired to criticize, and if possible enlarge upon, some of the points taken up by the President in his address. The Association was evidence of the activity and the vitality existing in the gas industry. An industry which did not possess within itself a youth, could not be on a sure foundation, because necessarily the shoes of those who passed, as time went on, must be filled. There was one aspect of their business which perhaps had not had their attention so much as might be desirable. He referred to the commercial aspect. Gas managers were nothing now if they were not commercial men. The engineering side of the business was necessary, so far as building the works was concerned; and the chemical side also, so far as regarded efficiency and economy in working the plant. But they might take it from him that when they entered into a position of responsibility for the management of gas-works, the commercial aspect obtruded itself very largely indeed. The President had referred to the importance of making tests. The constructional part of a gas-works was most important, so far as the capital account was concerned; but he would essay this statement, that the commercial side was the part which was most important, so far as the economy of working the materials was concerned. If they took, for instance, the question of purification, there they had essentially a chemical action going on; and unless they were familiar with the conditions, and the temperature necessary to bring about efficient purification, results might accrue which would be very damaging indeed. In connection with oxide of iron, he would wish to put forward the opinion that it ought to be bought upon a proper basis. They knew that a paper manufacturer, when buying pulp, bought it upon a chemical analysis of the amount of moisture present; and the chemical manufacturer, in buying caustic soda, purchased it upon the basis of the amount of sodium oxide contained in it. Why should gas manufacturers not buy oxide of iron upon the basis of its percentage of real purifying material—viz., Fe_2O_3. He thought this could be arranged perfectly well. If they bought at a rate per cent. of efficient Fe_2O_3, they would be able to compare the several quotations brought before them on an equal basis, and determine which was the most valuable, quite apart from any quotation which might appear to be most favourable, but which, on analysis of the substance, might be found to be less valuable. The President had referred to tests with a washer, and had shown that, where the rate of flow of the liquor was increased, the greater efficiency was obtained in the absorption of sulphuretted hydrogen and carbonic acid. This was just what they would expect. In the case of a brush scrubber, the rate of flow of the liquor was perhaps not so important as the speed at which the brushes were driven. He had found that if the speed of the engine driving the scrubber were increased, the amount of ammonia found at the outlet diminished. In the matter of the efficiency of the scrubber, a test for the amount of ammonia passing was very important. The usual qualitative test with turmeric paper was fairly satisfactory, but only up to a certain point. In his opinion, tests should be made from time to time by passing a measured volume of gas through standard acid, and calculating the amount of ammonia in grains per 100 cubic feet of gas. They would find that if the brushes became clogged with tar or pitch, and the temperature of the liquor was from 70° to 73° Fahr., the efficiency of the scrubber had become less, and the amount of ammonia passing had considerably increased. He had observed lately, in his own works, when the scrubber was not acting, that the efficiency of the purifiers very much increased. Naturally, he concluded that this was brought about by the scrubber, which was not at work allowing a considerable amount of ammonia to pass, and therefore making the oxide in the boxes alkaline. They knew that the oxide frequently showed an acid reaction; and the proper way to treat it was simply to put in a little liquor to make it alkaline again. As regarded tests in sulphate of ammonia manufacture, he had these carried out regularly; and they were most valuable. For example, he took a portion of the waste gases leaving the saturator, passed them through a coil immersed in a barrel of water, and tested the condensed products for free ammonia. The object of this test was to ascertain if the saturator was in proper working condition. The condensed products from the heater were similarly tested for free ammonia, in order to ascertain whether the ammonia tubes were leaking. These tests were very easily carried out per gallon of liquor. The President had referred to trouble in regard to the stopping of the holder inlet and outlet pipes. In the past year, he had found the holder pipes partially choked; and the trouble was easily got rid of by placing 50 or 60 gallons of benzol in them, and connecting up steam to the ordinary pumping-pipe, whereby the benzol was gasified and the naphthalene gradually dissolved away. The conception which the President had formed as to the advantage of a number of gas-works combining for the sale of bye-products was one which had concerned gas companies for many years; but he ventured to say that if the system of selling residuals were made on a sliding-scale, they would be able to get the advantage of the changing market values of them. For example, during the present year the price of pitch had gone up considerably, and therefore they would be benefited; whereas in the case of a contract made for a whole year, despite the rise in value of the article, the advantage would, of course, not be obtained by them. Regarding the question of the adoption of vertical retorts, a new aspect of this matter had come before them in the charging of horizontal retorts full. He was satisfied that where a retort-bench had to be renewed, the adoption of vertical retorts was the best course; but he was further satisfied that where the capital account had to be considered, and the bench was not ready for scrapping, with machine charging and filling the retorts full results almost equally as good would be obtained. They would not, however, be so good with respect to labour, because with vertical retorts, and dealing with a large bulk of material with a minimum of work, the costs per ton must be very low. The President had referred to the influence of a day consumption as regarded holder capacity. At Alloa it was now eighteen years since the holder capacity was enlarged, and yet the manufacture had increased three times. At present the daily maximum was about 650,000 cubic feet, with a holder capacity of only 300,000 cubic feet; and yet they did not experience any trouble, simply because the hour-to-hour output of gas was more equally divided over the day. Another matter, which had just occurred to him, had reference to the accuracy of statistics as to the measurement of gas. He thought that the Junior Association might well take upon themselves the duty of starting right in regard to this matter. They all knew that in very few gas-works were corrections made for temperature and pressure in the measurement of gas. The effect of the temperature being above the normal was to increase the volume of gas; and this frequently happened where steam was used with oxide of iron purification. For the last three or four years, he had made daily observation of temperature and pressure, and had corrected to the standard the volume of gas manufactured. This enabled him to have data comparable one year with another. The data were also valuable in connection with the question of leakage. About three years ago, he caused a thermometer to be inserted in one of the street-mains, and observations made during the month of December showed that the gas was actually being transmitted to the consumers' meters at a temperature as low as 33° Fahr. The temperature during the summer months frequently rose to a little more than 60° Fahr. In preparing their statistics, they made a correction between the difference in volume of the gas as measured by the station meter under standard conditions, and the volume as measured by consumers' meters. For this purpose they determined an average temperature of 45° Fahr. over the whole year. The difference in volume, as corrected, amounted to 4,181,000 cubic feet on a make of 127 millions, and was equal to 3·30 per cent. In this they had evidence that accuracy was desirable, in regard to this matter, if their data were to be anything like correct. He could only add that it was a great pleasure to him to be present, and to know that the Association was entering upon another session with an enthusiasm which betokened well that it was doing good work.

The PRESIDENT said he was sure the members had all benefited by the remarks Mr. Napier had made. The question that he brought up last—as to leakage—was very important. He (the President) did not think there was sufficient done in the gas industry to get at the root of the leakage question. He moved that they thank Mr. Napier for the address he had given them.

Mr. D. BISSET (Edinburgh) said he quite agreed that in large works regular chemical tests were absolutely necessary. The testing of the flow of gases was a very important matter. He thought a great deal could be done by foremen in observing the condition of the ovens and the waste-gas flues. The figures given by the President as to the working of the washers were

similar to those obtained in their own works. The time would come when the bulk of the impurities in gas—sulphuretted hydrogen and carbonic acid—would be extracted at this part of the apparatus; and, in his opinion, a caustic liquor might be used to extract practically the whole of them, so doing away with purification in large boxes. The co-operative method of dealing with tar distillation looked very simple; but he did not see that it could be carried out. He was afraid the jealousy of the individuals would prevent the companies combining. The President had spoken about sharing the profits. What about sharing the losses? Then they would require to risk a lot of capital in putting down large works as permanent as gas-works. Further, it would be necessary to put the material upon the market as a finished article, because if only crude material were sent the distillers would have to buy it.

Mr. J. MITCHELL (Dundee), referring to finding crystals in the seal-pots, said that at Ardrossan they installed an Everitt tar-extractor between the condensers and the exhausters. It was not put in for naphthalene purposes, but for other tarry matter at the purifiers; and it remedied this. They did not get any tar in the oxide of iron; but they had the same trouble as the President, in the frequent finding of crystals in the seal-pots of the condensers. They also had some in the scrubber. As the tar-extractor was between the condensers and the exhausters, they had to use steam, which robbed the gas of tarry matter that had previously acted as a lubricant. Sometimes the exhauster became rather warm, and they had to put in some of the patent cylinder oil, which was merely creosote; and in this way they got over the difficulty.

Mr. T. W. HARPER (Dundee) complimented the President on two records which he had sent round for examination. They were really very fine, taking into account that he had no retort-house governor. In Dundee, where they had a Bryan-Donkin governor, he had taken off records a little better, but not much, than these. Besides the Bryan-Donkin governor, they had two which they made themselves. In these, they reduced the water space between the air-bell and the side, by which there was much less oscillation. If the engine ever happened to race, they had a shorter period for the steadying-up of the governor. Tar-extractors helped them to get quit of naphthalene; but, as Mr. Napier said, this could easily be done away with by putting in benzol. In Dundee, they adopted the same method as Mr. Napier. The President mentioned testing for carbonic acid in waste gases. He knew big boiler installations in connection with which they had put in carbonic acid recorders; and since then they had obtained a great saving in fuel—amounting, in some cases, to about 15 per cent.

Mr. R. B. WADDELL (Dunfermline) said that they had no trouble with the exhausters in working the retort-house governor in the ordinary way.

Mr. HARPER considered it was not fair to a retort-house governor to have a bye-pass working against it. He had such an arrangement; but he cut out the bye-pass, and gave the governor full justice. After this, its working was perfect.

Mr. J. R. MOYES (Granton), referring to the suggestion about combination in tar distilling, said there were so many large distillers that they practically held the market; and the combination would have to fight them, which he did not think would be at all judicious.

Mr. H. E. DORAN (Granton) asked Mr. Napier if he meant that gas managers ought to get a thorough commercial, as well as an engineering, training.

Mr. NAPIER replied that his reason for mentioning the matter was that he thought it would be well for them, if they could get some gentleman well qualified to do it, to bring the subject before them. They would find, when they came to be interested in managerial methods, that the commercial side was the most important. Therefore they should endeavour, in another session, to get someone to deal more particularly with the commercial aspect of their business.

The PRESIDENT thanked the members for the way they had received his address. After the tar-extractor was put in, it was observed that crystals began to accumulate in the seal-pots and in the dip-pipes of the condensers. At first, he was of opinion that they were naphthalene; but the crystals were soluble in water, and he ultimately found that they were carbonate of ammonia. He thought their presence was due to the condensation which took place. They found them at the outlet. Co-operative tar-distilling was put into his head by the fact that this method of working was practised in some places. In New Zealand, the dairy farmers worked in co-operation, on the basis he had indicated; and they found it satisfactory. The idea of the sliding-scale was certainly the best to adopt at present; but they had not the advantage of competition in getting rid of bye-products. It was with a view to getting full value for them that he thought of co-operation. Benzol would certainly clear away a naphthalene choke in gasholder valves. The method of using it referred to by Mr. Napier and by Mr. Harper, however, would carry the naphthalene forward into the holder, from which it would be taken on to the mains and services; whereas, if the work were done in the way he had indicated in his address, the naphthalene would be removed, and not give any further trouble. It might take longer to accomplish the clearing of the choke, but in the long run the trouble was altogether removed. In every test he had made, he had found an increase of naphthalene at the outlet of the Everitt tar-extractor. He thought this was due to the picric acid test. He did not think the picric acid test was so reliable when they were dealing with crude gas as it was when they were dealing was gas partly freed from tarry matter; and in this way the increase might be accounted for.

NEW MEMBERS.

The HON. SECRETARY intimated that, as the result of the circulars he sent out, they had obtained ten new members, which was fairly good work. The members cordially endorsed the opinion.

THE ADVANCEMENT OF MEMBERS.

The PRESIDENT said that since their last meeting there had been some changes among their members. They regretted that Mr. Herring was leaving them. He had taken a great interest in the Association since its inception, and had contributed handsomely to their library. Mr. A. Masterton, the first President of the Association, had obtained well-deserved promotion from the Edinburgh and Leith Gas Commissioners. Mr. A. Morton Fyffe had gone from Dundee to Nelson; Mr. J. Mitchell from Ardrossan to Dundee; and Mr. J. D. Keillor from Lochgelly to Ardrossan. Just before the end of last session, they had Mr. J. Dickson's promotion from Kelty to Forfar, and Mr. H. Rule's from Falkirk to Kelty. It was very pleasing to see that their members were making their way and their mark in the world.

The HON. SECRETARY intimated the receipt from Mr. A. Morton Fyffe, for their library, of two volumes upon mechanical engineering, by Professor Johnson, of the Technical College, Glasgow.

Brussels Exhibition Awards.—In the notice of the Brussels Exhibition which appeared in the "JOURNAL" for the 28th of June in connection with the visit of the Société Technique, it was mentioned that Mr. George Wilson, of the Hague, Brussels, and Coventry, had in the Dutch Pavilion an excellent show of both wet and dry gas-meters. We learn that he has been awarded for it a Diploma of Honour, which is of higher value than the Gold Medal. Taking into consideration the large section of gas-meters, gas appliances, &c., the award is considered to be remarkably good.

Manufacture and Taxation of Gas-Mantles, &c., in Germany.—The imposition of taxes on matches, gas-mantles, electric lamps, &c., in Germany last year, has led to a separate return being made in the revenue statistics of the Empire of these classes of goods. The first set of figures published refers to the six months, from Oct. 1, 1909, to March 31, 1910. The tax on matches during that peried yielded 7,079,008 marks (= about £347,010). The gas-mantles made numbered 61,380,188, while 20,784 were imported; and the tax thereon yielded 1,526,952 marks (= about £74,850). The taxes on electric lamps, arc carbons, &c., yielded in the same period 5,194,339 marks (= about £254,624).

Use of Motor Vehicles by Gas Companies.—The current number of "Progressive Age" contains an illustrated article on this subject. As the result of a canvass of a limited number of gas companies in the United States, statistics were obtained which showed that 76 companies have in use 165 automobiles, 68 motor trucks, and 150 auto-cycles—in all, 383 vehicles. For speed, the gasoline car is stated to be the more desirable; and many companies having both electric and gasoline trucks appear to prefer the latter. The Consolidated Gas Company of New York have the largest number of automobiles—thirteen; the Detroit City Gas Company having twelve, the Boston Consolidated Gas Company nine, and the Rochester Railway and Light Company eight. With a few exceptions, the other companies have three, two, or only one.

North of England Gas Managers' Association.—The half-yearly meeting of the Association will be held next Saturday, in the Lecture Theatre of the North of England Institute of Mining and Mechanical Engineers, Newcastle-on-Tyne, under the presidency of Mr. J. Lewis, of Newcastle. According to the circular issued by the Hon. Secretary (Mr. Herbert Lees, of Hexham), the morning will be devoted to a visit to the Elswick Ordnance Works of Messrs. Armstrong, Whitworth, and Co.; and the meeting will be held at noon. The business will consist of the submission of names of candidates for membership and the delivery of the President's Inaugural Address. In the early afternoon, the members will have a trip down the river, and dine together in the Bath Hotel Assembly-Rooms, Tynemouth.

A Large Gas-Engine.—According to a paragraph in the Engineering Supplement to "The Times," one of the largest four-cylinder vertical gas-engines ever built is one of the Nash type, recently completed by the National Meter Company, Brooklyn (N.Y.), for the Phœnix Tube Company of that city. It is directly connected to a 200-kilowatt direct-current generator, and will be used for general power and lighting purposes. The engine and generator together occupy a floor space of 23 ft. 4 in. by 7 ft. 6 in., and the height of the engine above the floor line is 11 ft. 3 in. The weight of the engine alone is 46 tons. Its cylinders are 18 inches diameter and 18-inch stroke; and the crank-shaft is 9 inches diameter. There are two entirely independent systems of ignition, both electro-magnetic, which can be used separately or together. Two spark-plugs are provided in each cylinder; and when both are used at the same time, there is practically no chance of miss-fire, even with gas of poor quality.

REGISTER OF PATENTS.

Electrically Lighting Gas-Burners.

DELAGE, M., and WOOG, P., of Paris.

No. 17,486; July 27, 1909.

This invention relates to a method of electrically lighting upright incandescent gas-burners by means of induction sparks; the sparking taking place at the head of the mantle between two electrodes whose distance apart is maintained unalterable (except by special manipulation) by an insulating plug adapted to facilitate the removal of the mantle and its supporting gallery without at the same time altering the distance apart of the electrodes or the substantial position of the plug with respect to the new mantle when put in position. Though the part obstructing the removal is easily movable, the arrangement is such that the part can be easily replaced in the same substantial position without trouble.

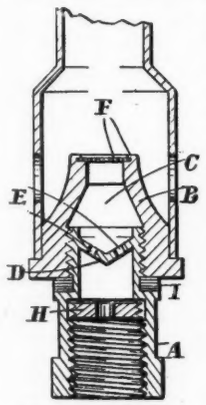
The arrangement is not further described by the patentees apart from a lengthy specification illustrated by six sheets of detail drawings.

Atmospheric Gas-Burners.

NIESER, E., of Gloucester Road, Kensington, W.

No. 19,174; Aug. 20, 1909.

This invention refers more particularly to connector devices or thimbles of the kind described in patent No. 17,632 of 1907; the object being "to economize the use of gas and produce a better combustion of gas and air at the burner or burners, with a more equal pressure, thus giving a better and steadier light."



Nieser's Atmospheric Gas-Burner.

As shown, the usual thimble or tubular connector A that engages with the nipple B of the burner forms the chamber C with an inverted cone D with a chamber or recess at its outer or burner end. In the inverted conical portion are a plurality of small holes E at an angle so that the gas will issue in fine streams which will break up against one another, thereby retarding the flow of gas, which is then more readily able to take up the air when passing through the nipple of the burner F to the air-tube above.

Another feature consists in the arrangement within the central bore of the thimble connector of a perforated disc or baffle-plate H in place of the usual wire gauze. This assists in breaking the first impact of the gas pressure, and at the same time prevents the entry of *débris* to the small holes of the inverted cone. The plate is screwed into the nipple, and rests against a shoulder about midway of its length.

Where the nipple connector is attached to the burner spit, an integrally formed lead or other soft metal washer I ensures the making of a gas-tight joint at this point.

Generating or Producing Gas.

CAMBRIDGE, A. S., of Christchurch, New Zealand.

No. 19,639; Aug. 27, 1909.

This invention relates to water-jacketed gas-producers for use in generating gas to be supplied to internal combustion engines or like heating purposes. The apparatus is so constructed that the air for combustion is passed over the water in the jacket and down through the fuel. There is an inner chamber for the reception of the fuel; and an outer surrounding chamber for the reception of water. Tubes lead through the walls of the inner chamber into the outer chamber, and others lead therefrom so as to extend above the water within the outer chamber. In this way, air circulating over the water passes through the tubes to enter the inner chamber at different positions. The chambers are arranged to receive hollow plug-valves, so that the admission of air through the tubes entering the sleeves and extending above the water within the outer chamber may be properly regulated.

Compressing Gas or Air for Lighting or Heating Purposes.

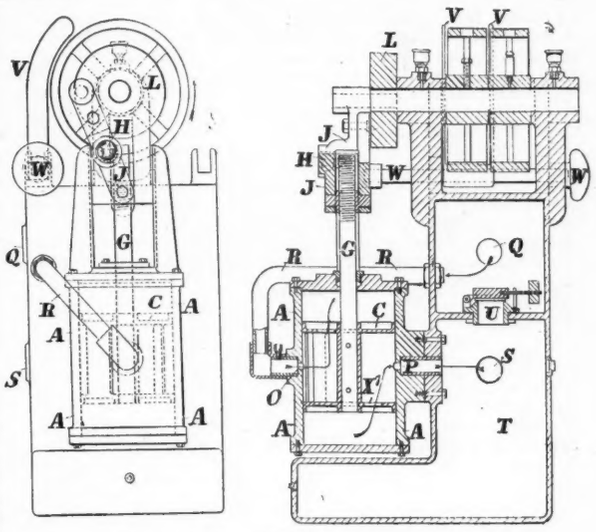
FLETCHER, E., of Tottenham.

No. 20,031; Sept. 1, 1909.

This invention has reference to apparatus in which the supply of compressed gas or air (or a mixture of both) is fed to the reservoir or to the burner at any predetermined pressure. It has for its objects to improve the apparatus described in patent No. 26,719 of 1908, "whereby gas or air, or a mixture of both gas and air, may be compressed, and caused to flow in one direction only without the use of valves, and to render the apparatus more effective, and to maintain a more constant pressure in the reservoir, or at the point of combustion."

The cylinder A is provided with an inlet port O and an outlet port P. Q is the inlet from the source of supply, whence the gases are conducted to the inlet port through the pipe R. S is the outlet from the reservoir T. U is a bye-pass connecting the inlet chamber with the reservoir T; suitable means being provided whereby any excess of gas or air in the reservoir at any predetermined pressure will be permitted to pass away into the chamber communicating with the source of supply, whence it again passes through the compressor. V is a fork connected to the striking rod W, whereby the belt is transferred from the loose to the fast pulley, or *vice versâ*.

When motion is imparted to the disc crank L, the connecting rod J is caused to descend, during which movement its angle, relatively to the piston-rod, is changed, thereby imparting a radial movement to the projection H, which is transmitted, through the rod G, to the piston C.



Fletcher's Gas and Air Compressing Plant.

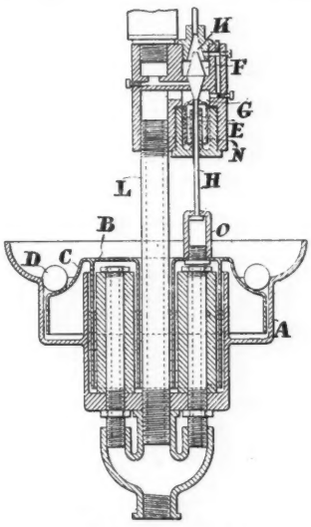
By these means each end of the cylinder will be open to the emission port during each of its periods of compression—thereby maintaining a practically constant flow of compressed gas or air (or both) to the reservoir T, while the inlet port O will be open to each end of the cylinder during the period of suction—communication between the chambers E F and the upper and lower ends of the cylinder being provided through the ports X X^1.

Gas-Burner Valves.

BLAKE, E. W., of South Croydon.

No. 21,126; Sept. 15, 1909.

This invention relates to valves for use in connection with gas-burners provided with pilot lights—especially to valves controlled by variations of gas pressure and provided with means whereby, when the supply of gas is passing to the main burner, the pilot light is extinguished, and *vice versâ*.



Blake's Gas-Burner Valve.

The illustration shows one form of the valve applied to a controller of the kind described in patent No. 14,973 of 1909.

A is the container of the controller, and B is a bell having an inclined or curved neck C for receiving the balls D designed to roll off the bell when the latter reaches a certain height, so that it can afterwards be operated by gas at a lower pressure than that required to lift it. E is the valve casing having the two chambers F G through which the valve spindle H passes. Upon the spindle are mounted the two valves in the form of cones placed base to base; the valves being arranged to co-operate respectively with a seat between the chambers F G, and with another seat K at the top of the upper chamber in communication with the pilot burner. The main supply of gas is introduced through the pipe L into an orifice in the lower chamber G; and, when the cone valve is lifted by the rising bell B, it escapes from the chamber G into the burner-tube. When the cone valve is in its lowermost position (as shown), gas from the lower chamber G passes through the passage M to a passage opening into the valve-seating K.

When the cone valve is lifted by the bell B in the usual way, the flow of gas to the bye-pass is closed; while the passage is open to permit gas

to flow to the burner. When, however, the cone is closed upon its seat (as shown), the upper valve is removed away from its seat K; so that gas flows from the lower chamber G directly to the pilot burner—the main supply of gas being cut off.

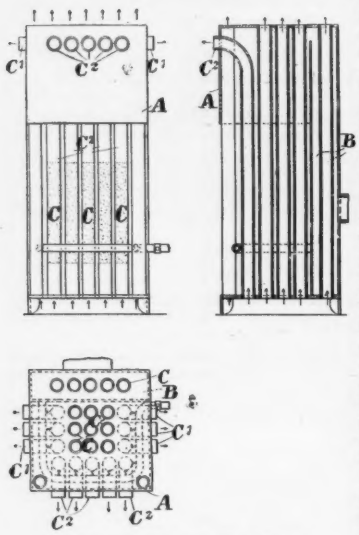
The valve-rod H, which passes through the lower part of the casing E of the valve, is sealed by a mercury seal N. The rod is controlled by the bell B in the following way: The bell is formed at its upper part with a cylinder O, into which the lower end of the spindle depends; the said spindle inside the cylinder being provided with the collar or head against which the contracted end of the cylinder wall acts. The cylinder is of such a length that it is capable of moving a certain distance independently of the valve-rod, in order to allow of the movement of the bell B without operating the valves. When, however, the bell has risen to a certain position, its top comes into contact with the collar or head upon the valve spindle, thus raising the latter so as to close the bye-pass valve and open the main valve to the burner. On the other hand, when the bell drops, it moves a certain distance before pulling down the valve-rod; the inoperative stroke of the bell, in both the upward and downward direction, being for the purpose of enabling the balls D to be removed from the bell and replaced on it before the valves are actuated.

Gas-Stoves.

ROBINSON, T., of Kilburn, N.W.

No. 24,446; Oct. 25, 1909.

According to this invention, above the grate of the stove is a hood A, closed at the top, front, and sides, and open at the bottom. At the back of the grate is a down-flue B, the front of which forms the back of the grate and extends upwards into the hood, to within a short distance of its top, so as to leave a communication to the flue, which at its lower part communicates with the chimney. Vertically placed air-heating tubes extend from below the grate up so as to be heated by the gas-fire and through the hood; some of the tubes, C, passing through the top of the hood, some, C^1, passing through the sides, and some, C^2, through the front. The tubes are open at their lower and upper ends, and may be covered with fire-resisting material at the part on which the gas-flames impinge, or which passes through the grate containing fire-clay balls heated by the gas-flames. D represents the bunsen gas-burners, which are arranged so that the jets impinge against the air-tubes.



Robinson's Gas-Heating Stove.

The heated gases from the burners pass directly into the hood A, where they give up a portion of their heat to the metal top, sides, and front. They then pass over the back of the grate, which forms a mid-feather or partition in the hood, into the down-flue B, where they give up a further portion of their heat to the walls of the flue, and at the lower end of the flue they pass to the chimney.

The operation of the air-tubes is as follows: As they become heated by the gas-flames, currents of air are induced to pass up them from below; the air entering unheated and pure at their lower ends, and being directed laterally and upwardly into the room at their upper ends (where the tubes may be bent outwardly, as shown) "hot and uncontaminated with the fumes from the gas-flames, so that a very beneficial heating effect is obtained."

Counting Apparatus for Meters.

STROMBERG, A., and WILLIS, G. M., of Chicago, U.S.A.

No. 2275; Jan. 29, 1910.

This invention relates to a counting apparatus for meters or the like, in which the operation of the counting wheels is effected by a weight-actuated driving member, which, after being raised under the action of the meter, is caused to drop to its initial position under influence of gravity. The power necessary for driving is reduced to a minimum by the raising as well as the drop movement of the member for driving the counting wheels being caused to take place along a rectilinear course. This driving member is by preference in the form of an arbor engaging with the counting wheels by means of a worm or the like, and rotated from the meter shaft. The arbor is axially raised during its rotation by means of a spiral cam and a supporting roller; and once in each revolution the arbor falls, owing to the cessation of the support of the cam, and acts as a rack upon the engaging worm wheel. Thus the only power required for driving is reduced to that which is necessary for the rotation and raising of the arbor, which is very small.

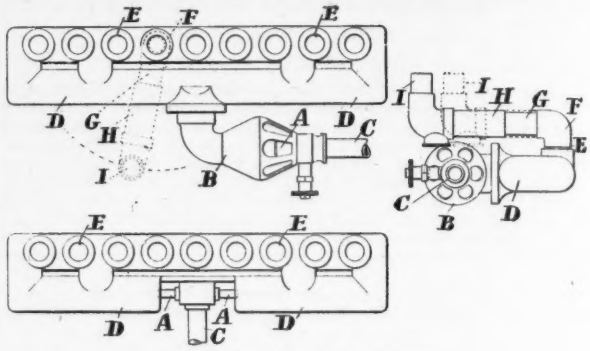
Atmospheric Gas-Burners.

TILLEY, F. C., of Kingsland Road, N.E.

No. 25,006; Oct. 30, 1909.

This invention relates to the atmospheric gas-burner described in patent No. 23,810 of 1904, and is intended to form "a patent of addition thereto."

The illustrations show a plan of the burner with one gas-nipple and air inlet, a feed-pipe of oblong shape with one of the bends, tubes, and burners in dotted lines; also a burner with two gas-nipples (the bends, tubes, and burners being removed), and an end view showing the bend, tube, and burner—full lines extended, dotted lines not extended.



Tilley's Atmospheric Gas-Burner.

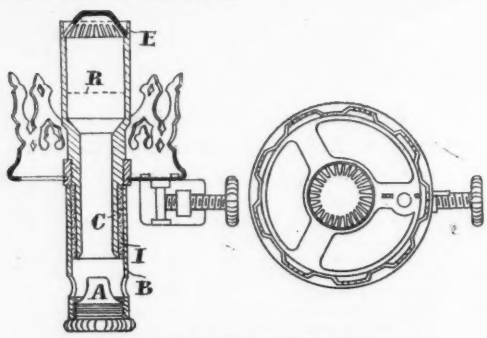
The gas-nipples A and air-mixing chambers B are connected to the gas-supply pipe C and the feed-pipe D, one side of which is provided with screw-threaded holes E, to which are connected bends or angles F, carrying the telescopic tubes G H (which, in this case, are not provided with air inlets), each one of which carries a burner I proper. In some cases the gas-nipples may be connected to the supply pipe, and the air-mixing chambers formed in or of the feed-pipe itself (as in the second form shown). The bends or angles are movable with regard to the feed-pipe, so that the telescopic tubes can be placed at any angle desired for their burners to be positioned in the same manner as in the earlier patent. The mixture of gas and air is in this way created before it reaches the telescopic tubes, and not in the telescopic tubes as in the 1904 patent.

Incandescent Gas-Burner.

SÜSSMANN, H., of Berlin.

No. 27,869; Nov. 30, 1909.

In upright burners for incandescent gas-light, the tube which carries the burner-crown and the burner-head is commonly fixed on the nozzle tube, the patentee remarks, so that the heat which is conveyed to the tube of the burner-crown, in consequence of radiation and conduction, is carried away in an outward direction. It has also been suggested to insulate the tube carrying the burner-head from the nozzle-tube in such a manner as to prevent the conduction of heat from the flame to the nozzle-tube. The object of his invention is to produce an upright burner for incandescent gas-light, in which the heat conveyed to the metal parts by radiation and the conducting properties of the metal are utilized for heating the mixed gases.



Sussmann's Incandescent Gas-Burner.

In the arrangement shown, the tube B is screwed on the nozzle A, and carries the upper part of the burner-crown in such a manner that the burner-tube C is inserted into the nozzle-tube. The burner-tube is closed at the top with a gauze, below which a sieve R may be fixed. From the fact that the burner-tube C is not pushed over the nozzle-tube in the usual manner, but inserted into the nozzle-tube B, it is said to result that "the mixture of gas and air comes into direct connection with the burner-tube heated by the flame through radiation and the conducting properties of the metal; and in consequence the heat is utilized in an advantageous manner." In order to diminish or avoid the transmission of heat from the burner-tube C to the nozzle-tube B, there is placed between the two tubes an insulating mass I, in the form of a tube of some material of bad conductivity; and to assist the absorption of heat, the burner-tube C may be provided at the upper end with a rim E projecting beyond the gauze top.

Gas-Washers.

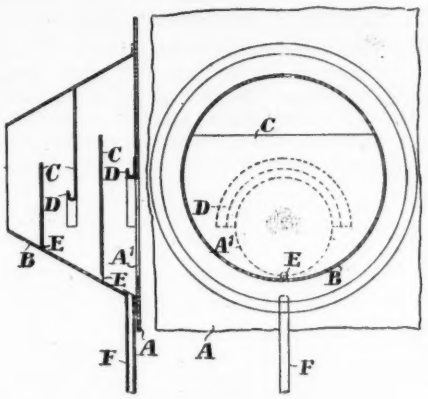
DAVIS, G. K., of Manchester.

No. 4543; Feb. 23, 1910.

This invention relates to gas-washers of the kind described in patent No. 2113 of 1909 [see "JOURNAL" Dec. 28, 1909, p. 891].

In the employment of washers of this type, it has been found that where the volume of gas to be treated is great a proportion of the spray produced by the fanners in each chamber is carried by the gas into the succeeding chamber. In the ordinary treatment of gas with water, this transference of spray from one chamber to another causes no great inconvenience; but where gas is washed with liquor to absorb a certain constituent—that is, where the gas and washing liquors are caused to

flow in contrary directions through the several chambers, and where the liquors in the chambers are prevented from commingling, the transference of spray from chamber to chamber is a disadvantage, inasmuch as in course of time the liquors in the several chambers tend to become of one uniform strength.



Davis's Gas-Washer.

In the present invention, the gas is prevented from carrying forward the spray by the provision, in connection with the lateral apertures in the transverse partitions, of spray arresters, which collect the spray so carried forward at the entrance to each chamber, and return the collected spray to the liquor at the bottom of each chamber.

A longitudinal section of a spray arrester, made according to the invention (designed to be fitted to a circular aperture), also a vertical section are shown.

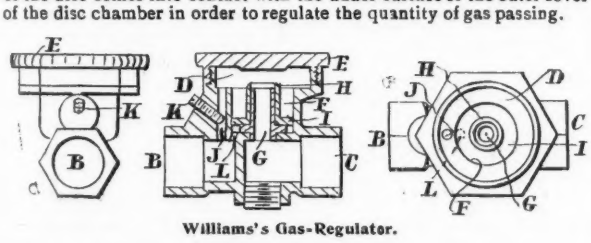
A represents a portion of one of the transverse partitions, and A^1 is the aperture through which the gas is caused to zig-zag through the washer. B is a short truncated cone eccentrically fitted around the aperture, and preferably with the latter at the lower part of the cone, which is secured to the partition by its base or end of larger diameter. The diameter of the small end of the cone is advantageously (as shown) equal to that of the aperture in the washer partition. C are the baffles fixed at right angles to the axis of the cone, and forming with it segmental passages for the gas, arranged in staggered form. D are channels to convey the entrained spray to the sides of the cone, so as to prevent the gas from carrying forward such spray as would fall vertically across the apertures. E are holes at the bottom of the lower baffles for permitting the entrained spray to run down the cone into the pipe F, which is sealed in the liquor lying at the bottom of the chamber.

Gas-Regulator.

WILLIAMS, G. A., of Stoke Newington, N.

No. 7651; March 29, 1910.

This gas-governor is of the class in which a floating disc is employed, secured to a sleeve working on a tubular guide through which the gas passes to the discharge, and placed in a chamber—either sleeve or guide (or both) being perforated. The object aimed at is to simplify the construction of regulators of this class, which have heretofore been combined with a plug or like cock, so that the effective area of all the passages may be controlled, and in which the upper end of the sleeve of the disc comes into contact with the under-surface of the outer cover of the disc chamber in order to regulate the quantity of gas passing.



Williams's Gas-Regulator.

The outer case (as shown) is provided with inlet and outlet passages B C. D is a chamber provided with a screw cap E, and at the bottom of which is formed a circular cavity F. Secured in the bottom of the cavity is one end of a tubular guide G, down which the gas passes to the outlet. Slidably mounted upon the guide is a sleeve H, attached to which is a disc I, which accurately fits within the cavity, but which is of such dimensions that it can move freely in it in either direction. Communicating at one end with the gas admission and at the other with the chamber D is a passage J, the cross sectional area of which can be regulated from the exterior by a stud K, screwed into the projection formed upon one side of the casing. In order to facilitate its operation, it is set at an angle so as to be more readily accessible than if arranged at a right angle. L indicates a second passage, which at one end is also in communication with the gas inlet and at the other communicates with the bottom of the cavity F, so that the disc I is thus subjected to gas pressure upon both sides. Accordingly as the pressure upon one side or the other varies, so the disc travels up and down or remains stationary upon its guide. The upper end of the sleeve of the disc is chamfered off; and as the pressure varies the end of the sleeve is brought nearer to, or is removed further from, the inner surface of the cover of the chamber. By this means, the variation in the pressure, acting upon the disc, controls the flow down the hollow guide, and a "substantially constant amount of gas is permitted to pass through."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Blue Water Gas v. Carburetted Water Gas.

SIR,—Kindly allow me to say a few words with regard to the article, on "Blue Water Gas v. Carburetted Water Gas," published in your issue of the 23rd ult.

The writer of the article seems to lay stress on the point that both the blue and the carburetted water-gas plants, figures of which he quotes, are possessed by the Amsterdam Gas Department, and that therefore it is a good case for comparison. If, however, it is borne in mind that the water-gas plants are situated at two distinct works, as far apart as some stations belonging to different companies in London, and also that the staffs of these particular works are to a certain extent independent of each other, the advantage claimed by Mr. Van Rossum du Chattel seems hypothetical. For the purposes of his comparison, Mr. Van Rossum du Chattel must therefore rely upon two sets of figures given to him by two sets of men, just as has been the case with other published statistics; while upon the attitude of the men in charge of the plant, a great deal depends.

As regards the figures given, a point that calls for some explanation is the reason for the consumption of coke for generators in the blue water-gas plant increasing so considerably. If a plant can be worked for a whole year with an average consumption of 30 cwt. of coke of indifferent quality, as stated in the report, per 100,000 cubic feet of gas, as was the case in 1906, it is sufficiently proved that the plant, if properly used, should maintain this output; and the increased consumption in the following years must be due to some external reason. This may be that the blue water-gas plant has been used a good deal for experimental purposes. The coke consumption in the carburetted water-gas plant has been relatively steady, with the exception of the year 1908, when it was very high—35·8 cwt. per 100,000 cubic feet. It is, moreover, quite as mysterious why in 1909 nearly double the amount of fuel was consumed for boilers in the blue water-gas plant as compared with 1906.

A very important point is the charge made for carburation. As everything here depends on the relative prices of benzol or benzine and oil, it would be interesting to know what quantities of benzine and oil were used in every year, and what the prices were.

The next remarkable figure given by Mr. Van Rossum du Chattel is the cost of repairs; and, knowing that the "K. & A." plant working for over three years at Uxbridge has had practically no repairs since it was installed, it seems strange that the cost of repairs to the blue water-gas plant at Amsterdam was equal to, or even higher than for, the carburetted water-gas plant. But the experimental work may account for a considerable proportion of this cost. Why, also, should 9d. be required for gas for lighting the blue water-gas plant and only 5d. for the carburetted water-gas plant?

Referring to the interest and depreciation charges, I cannot understand why 4 per cent. depreciation and 4 per cent. interest should be more for the blue water gas than for the carburetted water-gas plant. It is well known that the capital outlay for a blue water-gas plant is less than for a carburetted plant; and I may state that this is conspicuously the case with the "K. & A." plant. As matters stand at present, these figures for depreciation and interest are unacceptable to any gas manager intimately acquainted with the blue water gas and carburetted water-gas plants. Such figures must be lower for the blue water-gas plant than for the carburetted plant. From my knowledge of such prices under normal conditions, the cost for the blue water-gas plant should be from 20 to 50 per cent. lower than for the carburetted water-gas plant. In his report for December, 1906, which appeared in "Het Gas," Mr. Van der Horst (Mr. Van Rossum du Chattel's predecessor) states:

> The total cost for 100,000 cubic feet of gas at the Amsterdam Gas-Works for benzolized blue water gas was £6 9s. 7d., against £6 13s. 8d. for oil carburetted water gas. The figures for interest and depreciation relate to the total capital for buildings, mains, machinery, and plant; and there is included in this total figure the expenditure for boilers and boiler-house, both of which are double the actual requirements of the blue water-gas plant. It also includes the mains and pipes laid to and in the retort-house in order to bring blue water gas to the outlets of the hydraulics. Their influence on the price of the blue water gas therefore gives an unjust idea of their amount, and can, as soon as the shortly mentioned and less complicated arrangement is followed, be reduced by at least 50 per cent. If we should have been in the same fortunate position as the Eastern Gas-Works (carburetted water-gas plant), where for the whole works a spacious boiler-house was already in existence, and only an increase in the number of boilers was required, the capital outlay would remain within still narrower limits.

The figure mentioned above by Mr. Van der Horst, of £6 9s. 7d. for the blue water gas, includes the sum of £1 0s. 11d. for interest and depreciation, which, if reduced 50 per cent., as he states should be the case, would leave the cost of the blue water gas at £5 19s. 1d., as compared with £6 13s. 8d. for the carburetted water gas.

From the article in question, it would appear that benzine is used for carburation and not benzol, which latter is the usual enricher in this country; and in this connection it is worthy of note that the late Manager of the Amsterdam works concluded in 1906 that benzine did not fall out, and that the new Manager in 1909 came to exactly the opposite conclusion. May it be suggested that the later supply of this enricher is of a less suitable quality, as the specific gravity is higher than that of commercial petrol?

Moreover, the question of the cost of fully enriching blue water gas to an equality of illuminating power with the bulk output is local, and only concerns the few gas undertakings where it is practised. The more general use of blue water gas is as an admixture with coal gas of an uneconomical richness, according to the most advanced modern practice with uncarburetted gas. Ten per cent. or even 12 per cent. of blue water gas can be added to a fine coal gas to the positive improvement of the combustion, rendering the flame more intense and cleaner burning; and this proportion can be doubled with the addition of a

very small quantity of benzol or petrol, certainly without any risk of condensation.

In conclusion, I should like to point out that the latest designs of the "K. & A." apparatus for producing both blue and carburetted water gas show great reduction in first cost and space occupied, without loss of efficiency. It might be of interest to Mr. Van Rossum du Chattel to know that quite a number of works in England at the present time are making blue water gas only in plants originally installed for the production of carburetted water gas.

H. E. SMITH, Engineer and Manager,
The "K. & A." Water-Gas Company, Limited.

39, *Victoria Street, S.W., Sept.* 22, 1910.

Tar Prices.

SIR,—With reference to your trade correspondence in last week's "JOURNAL," I must take exception to many of the statements—first that there are no outside ports quoting less than 40s. per ton. This is absolutely incorrect. Business has been done at 36s. net on the east coast; and I had offers of the best quality pitch at 37s. 6d., and could not find buyers. Also sales have been made in London at 37s. 6d. to 38s. per ton. With regard to the price of 40s. 6d. per ton f.a.s. Liverpool and 39s. 6d. f.a.s. Manchester, for a fortnight now I have offered to friends of mine in Manchester a fair quantity of pitch at 37s. 6d. f.a.s., with an indication that 37s. would be accepted, and they have not done business, nor do I think they can.

I agree that creosote is steady. But sales have certainly been made at under 2¾d. in bulk; and I know of one sale of half-a-million gallons at 2¼d. f.o.b. I understand that creosote is being offered in the States today at under the equivalent of this price, f.o.b. England.

To speak of solvent naphtha as being worth 11½d. naked cannot be correct, seeing that business has been done at 1s. (casks included), delivered London, which is certainly as dear as any centre in the kingdom; while as regards the heavy oils a very large contract was let in London last week at 2¾d. per gallon for one of the best makes.

Also with regard to the prices for tar. These certainly do not average 20s. to 26s. 6d. Even at the ports, 26s. is the outside price for tar; while important contracts have been let lately at 19s. to 23s.

54, *Leadenhall Street, E.C.,*
Sept. 26, 1910. M. MACINTOSH WILLIAMS.

LEGAL INTELLIGENCE.

A BOGUS GAS COLLECTOR COMMITTED FOR TRIAL.

At the Old Street Police Court, a few days ago, the story of a young man who, posing as a collector for the three London Gas Companies, went about rifling prepayment gas-meters, and disconnecting them under the pretence of "necessary repairs," was told when Henry George Atwell, 24, was charged with stealing moneys, amounting to £2 10s., the property of the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies respectively, on whose behalf the prosecution was conducted by Mr. Humphreys, Mr. Pasmore, and Mr. Young. Previous to the hearing, the accused was identified by upwards of twenty witnesses from different parts of London, whose houses he had visited and robbed.

The evidence given showed that the prisoner's methods were practically similar in each case. He called, representing himself as an inspector or collector of the Company supplying the district in which he might be; and, after stating that he had called in consequence of complaints received regarding the fittings, he would ask to be allowed to look at them. When faulty fittings were pointed out, he would apply a little white lead, and always finished by "inspecting" the meter. He would then empty the money-box attached to it; counting out the money in the presence of some one in the house, "so as to see that there was no mistake," and in some cases returning a few pence to the consumer as "bonus." In the greater number of instances, he disconnected the meters; and it was owing to his faulty connections that he was eventually found out. The police were then communicated with, and they were able to effect the prisoner's arrest.

The accused pleaded "Guilty," and asked to be dealt with; and his father also appealed to the Magistrate. Mr. Cluer, however, said the prisoner must go to the Sessions.

Robbing Slot-Meters at Derby.

At the Derby Borough Police Court last Wednesday, William and Margaret Bonnington, man and wife, were charged with loitering on various dates with intent to commit felonies, and with being found on enclosed premises. Prisoners pleaded guilty; and the Chief Constable said their habit had been to obtain the keys of unoccupied houses and visit them. They had always returned the keys; and in no instance had there been any attempt to take possession of the houses. But in every case they had tampered with the drawer in the slot gas-meter, and the money inside had been taken out. Up to February last, the man had been employed by the Midland Railway Company; but since then he had been out of work. On Aug. 26, bailiffs seized their goods for rent; so that there could have been no pressing necessity for them to take a house, because they had no goods. They were watched by detectives in consequence of complaints, and were found in a house, an entrance to which had been obtained by forcing the back window. The woman was outside; and as the detectives approached her, they heard the man come up the cellar steps, and say, "There's nothing in it." After witnesses had been called, the Chairman of the Bench said both the public and the Gas Company must be protected from such offences. They were inclined to believe that Mrs. Bonnington had acted upon the guidance of her husband. Bonnington would be sentenced to a month's imprisonment with hard labour on the first charge, and a further period of one month on the second charge; but Mrs. Bonnington would be fined 20s. in each case, with the alternative of 14 days, one sentence to follow the other.

MISCELLANEOUS NEWS.

AFFAIRS OF THE MID-OXFORDSHIRE GAS COMPANY.

Report by the Assistant Official Receiver.

Meetings of creditors and contributories in the Mid-Oxfordshire Gaslight and Coke Company, Limited, were held at the London Bankruptcy Court last Friday, when the report of the Assistant Official Receiver (Mr. W. J. Warley) on the Directors' statement of affairs, as at the date of winding-up, was presented. Prepared by the Secretary (Mr. E. C. Saphin), it furnished the following particulars:—

As Regards Creditors.

Gross Liabilities.	Liabilities.		Estimated by the Officers of the Company to Rank.
£21,392 16 5 ..	Unsecured creditors (103) . . .		£21,392 16 5
350 0 0 ..	Creditor fully secured	£350 0 0	
	Estimated value of securities	350 0 0	
176 6 9 ..	Preferential creditors, for rates, wages, &c. (11) deducted contra	176 6 9	
58,530 0 0 ..	Loans on debenture bonds (325) holders, deducted contra .	58,530 0 0	
£80,449 3 2			£21,392 16 5

Assets.			Estimated by the Officers of the Company to Produce.
Cash at bankers.			£471 12 0
Cash in hand			33 5 10
Stock-in-trade (estimated cost £62 10s.)			62 10 0
Other property—Gas-works at Bampton, Bicester, Charlbury, Eynsham, Highworth, Shipton, Woodstock, and Chipping Norton; and electric light works at the last-named place.			58,000 0 0
			£58,567 7 10
Book debts (1104 debtors), viz.—			
Good	£1683 1 5		
Unpaid calls (two debtors), estimated to produce	52 10 0		
			1,735 11 5
Estimated total assets			£60,302 19 3
Deduct preferential creditors as above			176 6 9
Estimated amount available to meet claims of debenture holders			£60,126 12 6
Deduct loans on debenture bonds secured on the assets of the Company			£58,530 0 0
Estimated amount to meet unsecured creditors, subject to cost of liquidation			1,596 12 6
Estimated deficiency of assets to meet liabilities, subject to cost of liquidation			19,796 3 11
			£21,392 16 5

As Regards Contributories.

Capital issued and allotted—			
188 ordinary shares of £10 each (38 shareholders)—			
Issued as fully-paid . . .	£690 0 0		
Called up on 119 shares. . .	1190 0 0		
1282 preference shares of £10 each (106 shareholders)—			
Issued as fully-paid	3500 0 0		
Called up on 932 shares . .	9320 0 0		
Amount paid in advance of call	5 0 0		
		£14,705	0 0
Add deficiency to meet liabilities as above		19,796	3 11
Total deficiency . .		£34,501	3 11

The deficiency account attached to the statement of affairs shows the expenses of carrying on the business from July 1, 1907, to the date of the winding-up order (June 28, 1910) as follows, omitting shillings and pence: Salaries, £840; rent, £397; rates and taxes, £644; law costs, £243; interest on debentures, £4803; miscellaneous expenditure, including postages, travelling, printing, insurance, and advertising, £1232. These items make a total of £8161; and as a total of £3251 was owing in regard to expenses of this nature at the date of the winding-up order, the actual amount due under the head of "general expenditure" is £11,412. To this total has to be added the Directors' fees from July, 1907, to the date of the order, £189; and depreciation of property (now written off by the Directors), £31,019—making a total of £42,620. The account shows that the excess of assets over liabilities on June 30, 1907, was £12; the gross profit arising from the business during the whole period from July, 1907, to the date of the winding-up order is given as £5760; transfer fees amounted to £14; the rent of the Bicester works to March, 1908, £184; and there was received from contractors, under guarantee as to gas consumption, £2149—making a total of £8119. The whole account thus showed a deficiency of £34,501.

In the course of his observations, Mr. Warley says: The winding-up order was made on June 28, 1910, upon a creditor's petition. The statement of affairs was submitted on Aug. 22, 1910, by Edward C. Saphin, the Secretary, and has since been concurred in by Charles Wheeler and William B. Martin, the Directors. The Company was incorporated on Oct. 10, 1905, with a nominal capital of £50,000,

divided into 2500 preference shares and 2500 ordinary shares, all of £10 each; its objects being to acquire several gas undertakings, with a view to economically working them under one management.

PROMOTION OF THE COMPANY AND PURCHASE OF WORKS.

The Company was nominally promoted by the Finance and Construction Company, Limited; the actual promoter being Mr. E. O. Preston, who also practically controlled the Company's operations throughout. The first Directors were Sidney R. Dennis and Frederick Miller, both of whom were appointed by the signatories. George Castle, Charles Wheeler, and Frederick C. Philpott were appointed Directors in March, 1906; and William B. Martin joined the Board in July, 1908. The three last-named persons formed the directorate at the date of the winding-up order. The qualification of the Directors was the holding of 10 shares each in the Company; and all were qualified. Their remuneration was fixed by the Company in general meeting at the rate of £250 per annum for the years 1905 and 1906, and thereafter at the rate of 60 guineas per annum, to be divided among them. On Nov. 14, 1905, a prospectus was issued inviting subscriptions for 10 preference shares. Applications were received for two shares, which were allotted. The minimum subscription fixed by the Articles of Association, and applicable to the first allotment only, was 10 per cent. of the shares offered; and this prospectus appears to have been issued with a view to complying with this article and obtaining a certificate to commence business.

Between November, 1905, and March, 1906, the Company entered into agreements for the purchase of several gas undertakings, as follows.

Nov. 21, 1905.—The freehold gas-works and undertaking at Bicester for £5883 10s., and certain outstanding costs due by the vendors, the Bicester Coal and Coke Company, Limited; the purchase-money being satisfied by £2400 in special debentures and £3613 15s. 7d. in cash

Nov. 24, 1905.—The leasehold gas-works and undertaking at Woodstock from the Woodstock Gaslight, Coke, and Coal Company for £2425, satisfied by special debentures £1615 and cash £810.

Nov. 27, 1905.—The freehold gas-works and undertaking at Witney, from the Witney Gas and Coke Company, Limited, for £12,000. This purchase was to be satisfied as to £4500 in special debentures, as to £5000 in cash, and £2500 in cash or preference shares and costs of winding-up the vendor Company. The Mid-Oxfordshire Company were, however, unable to complete the purchase within the time provided by the agreement, and it fell through, and the sum of £500 paid as deposit was debited to the Finance and Construction Company.

Dec. 14, 1905.—The freehold gas-works and undertaking at Chipping Norton from the Chipping Norton Gas and Coke Company, Limited, for £7771 11s. 8d., satisfied in special debentures for £4725, and cash for £3046 11s. 8d.

Jan. 3, 1906.—The freehold gas-works and undertaking at Bampton and Eynsham from the Bampton and Aston Gas and Water Company for £8000, satisfied in special debentures £4300, £1000 in cash, and £2700 in general debentures.

Jan. 3, 1906.—The freehold gas-works and undertaking at Shipton-under-Wychwood from the Shipton-under-Wychwood Gaslight, Coal, and Coke Company, Limited, for £3000, satisfied in special debentures £2000 and general debentures £1000.

March 1, 1906.—The freehold gas-works and undertaking at Charlbury, from Owen Walker, for £5250, satisfied in special debentures £3500, general debentures £300, and cash £1450.

THE COMPANY AND THE FINANCE AND CONSTRUCTION COMPANY.

The report proceeds to set forth that on March 23, 1906, an agreement was entered into between the Finance and Construction Company, Limited, and the Company, by which the former agreed to construct for the latter certain works, repair mains, discharge all expenses in connection with an application to Parliament for special powers, and pay all preliminary expenses and costs of carrying through the purchase of the undertakings above described. The consideration was fixed at £17,500. In order to provide funds to carry through the purchase of these undertakings and pay the Finance and Construction Company, a prospectus was issued on March 28, 1906, inviting subscriptions for 2000 preference shares, 2000 ordinary shares, and £15,000 of 5 per cent. debenture stock. The debenture stock, which formed part of an authorized issue of £25,000, of which £4000 had already been issued, gave a charge upon the whole of the Company's undertaking, subject to the special debentures issued or agreed to be issued in part payment of the purchase price of the undertakings set out above. The special debentures, in addition to being a first charge on the undertakings in respect of which they were issued, ranked *pari passu* with the debenture stock in the event of a deficiency of assets to meet special debentures. As a result of the issue of the prospectus, 383 preference shares, 171 ordinary shares, and £21,000 of debenture stock were issued; the debenture stock being £6000 more than the amount offered. The holders of the £4000 debenture stock were, in addition to the security already mentioned, entitled to the benefit of a redemption policy for £4000. This policy has, however, been allowed to lapse.

The purchase of the undertakings mentioned above was duly completed, except in the case of the Witney Gas-Works. The Directors state that before purchasing the undertakings, and before entering into an agreement with the Finance and Construction Company, Limited, they were advised by Mr. Joseph Quick (since deceased) that the consideration to be paid was fair and reasonable. No reports by him have been produced, though, according to the minutes, he appears to have made some. But they were sometimes made verbally. Mr. Preston appears to have been interested in several of the undertakings purchased by the Company. He has been requested to furnish all details of his interest, but has not yet done so.

A Bill was presented to Parliament in which the Company asked for special powers with regard to their undertaking. The Bill was considered by a Select Committee of the House of Commons, and on May 4, 1906, was rejected on the ground that the finances of the Company were unsatisfactory. On Dec. 11, 1906, an agreement was entered into between the Company and the Finance and Construction Company, Limited, by which the latter agreed to lay mains from Woodstock to Bladon, in consideration of the Company releasing the Finance and Construction Company, Limited, from any further obligation to apply to Parliament on behalf of the Company for special powers, and also from any liability to refund any moneys by reason of the work agreed to be done in connection with the Witney gas undertaking not being necessary in consequence of that undertaking not being purchased. By a subsequent agreement, it was agreed that the mains should be laid between Bampton and Aston, instead of between Woodstock and Bladon.

ACQUISITION OF ADDITIONAL WORKS.

In 1908, the Company agreed to purchase from the Finance and Construction Company, Limited, gas-works at Highworth for the sum of £10,500, which included certain work to be done by the vendors. The consideration was to be payable as to £7000 in special debentures carrying a first charge on the particular undertaking, and ranking *pari passu* with debenture stock against the general assets in regard to any deficiency; the balance of £3500 being payable in cash or shares. Special debentures for £6990 have been issued, and some portion of the balance has been paid in cash. The Finance and Construction Company are returned as creditors for £3492 8s. 7d. on general account. The Company's Engineer (Mr. A. F. Painter) reported that the price to be paid by the Company—£10,500—was fair and reasonable.

On June 20, 1908, a further prospectus was issued by the Company inviting subscriptions for 270 preference shares and £1620 of 5 per cent. first mortgage debentures, in connection with the extension of the Bicester works. The invitation to subscribe for first mortgage debentures appears to have been made, though not disclosed in the prospectus, on behalf of the Finance and Construction Company. Applications were received for 224 preference shares and £3690 of first mortgage debentures. The debentures appear to have been part of the £7000 of special debentures agreed to be issued to the Finance and Construction Company in connection with the purchase of the Highworth works. Some of the moneys received in respect of the preference shares also appear to have been paid to that Company in reduction of the Mid-Oxfordshire Company's indebtedness.

On June 24, 1909, the Company purchased the Chipping Norton and District Electric Lighting undertaking for £10,500, which was satisfied by the issue of £7000 of special debentures, carrying a first charge on the undertaking, and ranking with the debenture stock in regard to any deficiency, and by the issue of fully-paid preference shares for the balance—viz., £3500. No agreement has been filed with the Registrar of Joint-Stock Companies with respect to these fully-paid shares. The Directors state that the electric light works were purchased by the Company in order to abolish competition. The Company's Engineer recommended the purchase at £10,500.

RESULTS OF THE COMPANY'S TRADING.

The Company's trading, according to the accounts, has resulted as follows:—

From the incorporation to June 30, 1907	net profit	£11 19	7
For the year ended June 30, 1908	,, ,,	167 2	8
,, ,, ,, June 30, 1909	loss	1601 17	1
For the period ended June 28, 1909	,,	2541 13	5

On May 11, 1910, the Court, upon the application of special debenture-holders, appointed Mr. W. A. Slade, of 9, Old Jewry Chambers, E.C., Receiver and Manager of the Chipping Norton Gas-Works; and on May 12, 1910, he was also appointed by the Court Receiver and Manager of the Chipping Norton Electric Light Works and the Bicester Gas-Works. The Trustees for the special debenture-holders have also entered into possession of the Woodstock works. On May 19, 1910, the Company resolved to wind up voluntarily, and appointed Mr. H. A. Stevens, of 6, Dowgate Hill, E.C., Liquidator. On July 1, 1910, the Court, upon the application of the Official Receiver, appointed Mr. R. W. Thornton, of Queen Street, Oxford, Special Manager of the gas-works at Bampton, Eynsham, Shipton-under-Wychwood, Charlbury, and Highworth.

The unsecured creditors' claims—£21,392 16s. 5d.—are in respect of cash advanced by Messrs. E. O. Preston and Co., £9029 1s. 2d.; balance due to the Finance and Construction Company in respect of contract, &c., £3492 8s. 7d.; goods supplied and work done, £5569 17s. 3d.; salaries, £203 10s. 3d.; bank overdraft, £207 9s. 9d.; application money, £5; debenture interest £2871 16s. 5d.; and Trustees' fees £13 13s. The two latter amounts should have been included in the amount due under the debentures. The fully-secured claim—£350—is in respect of moneys advanced to Mr. Slade, the Receiver of the Chipping Norton works.

The failure of the Company is attributed by the Directors to their inability to obtain statutory powers and to shortness of working capital. In the opinion of the Official Receiver, it is also due to over-capitalization and inefficient management.

Appointment of a Liquidator and a Committee of Inspection.

At the meeting of creditors, the Official Receiver referred to the main features of the report, and pointed out that the total of £58,530 in debentures was composed of £25,000 of general and £33,530 of special debentures. Several creditors expressed the opinion that the nature of the debenture holdings was not clearly set out in the report; and a long discussion on this matter failed to produce any authoritative statement on the subject. A creditor asked the Official Receiver if he could express an opinion as to whether or not there would be anything for the debenture-holders; and he replied that it was impossible to say what the assets would realize. There certainly would not have been anything for anybody unless the goodwill of the business had been preserved by the appointment of Mr. Thornton as Manager. Mr. Thornton had authorized him to say that, while he could not give definite figures, he could state that the business had not been carried on at a loss during his management, and there might be a small profit. The question as to the rights of the respective debenture-holders, special and general, would probably have to be settled by direction of the Court. The meeting had only to appoint a Liquidator, and, he suggested, a Committee of Inspection; and he thought that they ought to choose Mr. Thornton, who had been acting as Manager, and was quite independent of anyone connected with the Company. As Official

Receiver, he held sufficient proxies to nominate himself as Liquidator; but it was quite impossible that he could act in a case at such a distance, unless he appointed an assistant, and this would be very expensive. He therefore asked the meeting to have Mr. Thornton; and he explained that, whatever Liquidator the creditors appointed, it remained for the Official Receiver to investigate the circumstances attending the promotion of the Company and its proceedings since its promotion. Mr. Walter Moore expressed the opinion that the Official Receiver would have to look beyond the accounts furnished by the Directors and the books of the Company to get at the real position.

Mr. Thornton was then unanimously appointed Liquidator, with the following Committee of Inspection: Mr. W. Moore, Mr. A. F. Waters (representing Mr. Walker), Mr. F. Templer Depree (Chairman of Messrs. Willey and Co., Limited), Mr. S. Cartwright (representing Miss Woodleigh), and Mr. R. Swade (representing Mr. R. J. Pead).

A meeting of shareholders subsequently confirmed these appointments without discussion. The Official Receiver remarked that, as there was only £2020 to meet the claims of the unsecured creditors, there could be nothing for the shareholders.

BRITISH GASLIGHT COMPANY, LIMITED.

Reduction to 1s. 10d. at Hull—Good Financial Position at Norwich—Dividends and Income-Tax.

The Half-Yearly Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, and also the report of the Directors. The accounts were taken as read, and the Auditors' report thereon was read. In compliance with the Act of Parliament, the Norwich accounts were read; also the Auditors' report thereon. The Directors' report was as follows:—

The Directors submit the half-yearly accounts of the Company to June 30 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £34,283, after deducting the following sums [omitting shillings and pence]: Income-tax, £2277; Hull debenture interest, £2119; Norwich debenture interest, £1779; Potteries debenture interest, £659; Trowbridge debenture interest, £165; interest on debenture stock, £2260—total, £9259.

HULL.—The gas-rental shows an increase of £34, as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows a decrease of £988; tar and tar distilling, an increase of £469; ammoniacal liquor and sulphate of ammonia, an increase of £478. Coals have cost 12s. 11d. per ton, as against 13s. 1d. Coke has realized 10s. 3d. per ton, as against 10s. 8d.

The gas sold shows an increase of 1,849,207 cubic feet, which is equal to 0·29 per cent. The quantity supplied in bulk to the Corporation for the supply of the Old Town was 43,126,000 cubic feet; being 1,531,000 cubic feet less than the quantity supplied in the same period of 1909.

The profit realized is £4723 in excess of the parliamentary interest. This sum has been invested; making the reserve fund £48,783.

NORWICH.—The gas-rental shows an increase of £368, as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 3s. per 1000 cubic feet. Coke shows an increase of £327; and tar and ammoniacal liquor, an increase of £784. Coals have cost 15s. 11d. per ton, against 17s. Coke has realized 14s. 11d. per ton, against 14s. 10d. The gas sold shows an increase of 4,425,500 cubic feet, which is equal to 1·75 per cent. The profit realized is £4971 in excess of the parliamentary interest.

POTTERIES.—The gas-rental shows a decrease of £555, as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. The decrease is attributable to the granting of further rebates to large consumers, and to a reduction in the price charged for public lamps. Coke shows a decrease of £23; tar, an increase of £132; and ammoniacal liquor and sulphate of ammonia, an increase of £215. Coals have cost 10s. 5d. per ton, as against 10s. 9d. Coke has realized 8s. 6½d., as against 8s. 7d. per ton. The gas sold shows an increase of 394,145 cubic feet, which is equal to 0·21 per cent.

The profit realized, after writing off the sum of £3189, on account of plant thrown out of use, is £7480, which is the amount of the authorized parliamentary interest. The balance to the credit of the reserve fund account is £1448.

TROWBRIDGE.—The gas-rental shows a decrease of £151, as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show a decrease of £94. Coals have cost 16s. 3d. per ton, against 16s. 11d. Coke has realized 11s. 8d., against 13s. 2d. per ton. The gas sold shows a decrease of 1,016,500 cubic feet, which is equal to 3·01 per cent. The profit realized is £570 less than the parliamentary interest.

HOLYWELL.—The gas-rental shows a decrease of £54; and residual products, an increase of £3. The profit realized is £467.

The available profit, added to the previous balance of profit and loss, amounts to £92,054. From this sum, the Directors recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, both free of income-tax. The dividend and bonus will amount to £27,562; and leave a balance of £64,492.

The Directors who go out of office are Mr. Corbet Woodall and Mr. Robert S. Gardiner; and the Auditors are Mr. E. Knowles Corrie and Mr. William Cash, F.C.A. They respectively offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report and accounts, said he hoped the shareholders would agree with him when he said the report that the Directors had laid before them was in many respects very satisfactory—that was to say, it was very satisfactory when one looked at the profits earned, and at the way the stations had generally been managed with regard to finances. But, of course, it might be considered by some shareholders that the rate of increase in the business had not been what it had been in the past. This was so to a certain extent; and especially was it noticeable at the smaller stations of Trowbridge and Holywell. But these two small places were affected by particular trades in the localities—the West of England cloth trade at Trowbridge, and woollen mills at Holywell. Entirely dependent upon the state of trade at these manufactories was the increase or the decrease of the sales of gas in the two towns.

In regard to Hull, the increase was apparently very small. It was 0·29 per cent.; but if they analyzed the accounts, it was found (as was pointed out in the report) that the diminution in the rate of increase was chiefly due to the small district for which the Company supplied the gas in bulk to the Corporation of Kingston-upon-Hull. The increase was really in the large outlying district in which the Company had the sole lighting; and while the price of gas in their own district was 2s., they were obliged to sell it in bulk to the Corporation at 1s. 6d. From this it would readily be seen that the Company preferred to sell the increase in the quantity of gas consumed at 2s., rather than at the lower bulk rate. This brought him to another point. The report informed the shareholders that the Company had accumulated a reserve fund for the Hull station of no less a sum than £48,783; and the Directors thought that, having such an ample reserve in hand, they might now reduce the price of gas to the consumers. They had accordingly given notice that, as from Oct. 1, the price of gas in the whole of their district (this did not apply to that of the Corporation) would be 1s. 10d. per 1000 cubic feet, instead of 2s. For two short periods in the life of the Company, it had been at 1s. 9d.; and the Directors hoped at no very distant date, they would be able to go back to this figure which existed a good many years ago. Otherwise, too, the business at Hull was doing exceedingly well. They had been obliged to enlarge their show-room there. The Directors had taken, on a fresh lease from the Corporation, the very handsome show-room the Company had held there for a period of years; and they were leasing also a portion of the adjoining premises, because the business in the way of fittings and cooking stoves was extending considerably. He told the shareholders on the occasion of their last meeting that one of the oldest holders at their Hull station required taking down; and there was now being fitted into the tank a spiral-guided holder. This was almost completed, and would be in order for the coming winter's use—at any rate, it would be ready for testing at the end of this month.

Then concerning Norwich, things had been going favourably there; and they were now able not only to earn their parliamentary interest (which was very satisfactory), but, what was still more satisfactory, they were obtaining some of the back-dividends due to them. So that, as the report said, they had received not only the parliamentary interest, but also a profit of nearly £5000, which went to their credit. It was owing to the circumstance of the Company getting back their own, that the Directors were able to give the shareholders the bonus, the payment of which he should move presently. One of the features at Norwich was that gas cookery lectures had been taken up very strongly. At several of the district schools, there had been lectures by experts, who taught the better use of cookers attached to slot meters. There was no doubt about it that this gave a great impetus to the use of gas among the poorer people of the city. The lectures were extremely well attended, and were much appreciated. Regarding the new tank and holder to which he referred at the last meeting, the tank was completed, and the holder was now being erected, and would be finished in the course of the autumn.

Turning to the Potteries station, it would be remembered that he had frequently alluded to the moving of the works to a new site in consequence of the mining operations affecting the holders and apparatus on the old site. Now the time had come when they were going to part with the old site where the Company had worked ever since its formation in the Potteries district. They were handing the site over to the purchasers, and it would now be occupied by other people, with the exception of the Assistant-Engineer's house, which the Company had leased for a term of years, as it was very suitable for them, and close to the new works. They had, as the shareholders were aware, been writing off very large sums out of profits, and also from the reserve fund for the new works at the Potteries; but there remained a sum of £8752 outstanding on account of plant thrown out of use. This, however, would be written off during a series of half years, and would not materially affect the financial arrangements of the station.

Generally, there was nothing much else to report. It was within the knowledge of the shareholders that the Company joined with other Companies in the promotion of the Standard Burner Bills, and in prosecuting them before the House of Lords and House of Commons Committees. Notice of further opposition had been given on third reading, which had been deferred to the autumn session of Parliament. They could only wait now to see what would take place then. There was going to be an interesting event almost immediately in this country—viz, the visit of the German Association of Gas and Water Engineers. The German gas engineers always treated the engineers of other countries who visited Germany in the most hospitable and liberal manner [Mr. CORBET WOODALL: Hear, hear]; and the Company had contributed the sum of £40 towards the expenses of entertaining the gentlemen who would be over here from Germany a week or two hence. They had also contributed towards the cost of the Gas Companies' Exhibit at the Japan-British Exhibition; but he regretted that the Companies had been unable to obtain space in a more prominent part of the exhibition.

There was one thing that he, as Chairman of the Company, wished to impress upon the shareholders—that was, the question of the dividends being paid free of income-tax. As shareholders were aware who read the financial papers, there had been a great deal of discussion among the banks and some of the bigger companies as to the advisability or inadvisability of paying dividends free of income-tax. He was himself strongly of opinion that all dividends should have income-tax deducted. He thought that it impressed upon people the incidence of taxation; and he did not think the Stock Exchange made the smallest difference in the price of stocks and shares whether or not a company paid their dividends free of income-tax. Therefore, if a 10 per cent. dividend was paid, whether it was free of income-tax or otherwise, the market price of the stock was just the same. Personally, he hoped that, before the next dividend was declared, the Directors would bring before the shareholders a resolution to pay the dividend less income-tax; but he was quite certain the Directors would so apportion the dividend that the shareholders would not suffer any loss in contrast with the amount of the dividend that they received on the present occasion.

Mr. FREDERICK WILKIN seconded the motion, which was unanimously carried.

On the motion of the CHAIRMAN, seconded by Mr. CORBET WOODALL, a dividend of 20s. per share, with a bonus of 2s. 6d. per share, both clear of income-tax, was declared.

Proposed by the CHAIRMAN, and seconded by Mr. WILKIN, Mr. Corbet Woodall was re-elected to his seat at the Board; and, moved by the CHAIRMAN, and seconded by Major-General W. T. CORRIE, Mr. R. S. Gardiner was also re-elected.

Acknowledgment having been made by both gentlemen,

Mr. KENNETH R. MACKAY proposed, and Mr. L. R. ABBEY-WILLIAMS seconded, the re-election as an Auditor of Mr. E. Knowles Corrie. This was agreed to. Then a similar resolution was moved by Mr. BERNARD F. HARRIS, seconded by Mr. A. G. BURNEY, reappointing Mr. William Cash, F.C.A., as an Auditor.

Mr. BURNEY, in moving a vote of thanks to the Chairman and Directors, remarked that, in these days of the strained relations between capital and labour—a movement which, in some competent opinions, seemed likely to be aggravated—it must be a source of much gratification to the shareholders of this Company that they had a Board in whom they could place such implicit confidence.

Mr. MACKAY seconded the motion, which was cordially passed.

The CHAIRMAN, in responding on behalf of himself and his co-Directors, said, with regard to the question of capital and labour, he could only say the Company were on the very best terms with their employees at every station. The Board were always ready to meet the men in every reasonable way, and to assist them when required. He desired to move a vote of thanks to the Secretary and the other officers of the Company, who were really the most important people, he considered, in a concern of this kind—far more important than the Chairman and Directors. It was owing to their intelligence, skill, ability, and devotion to the interests of the Company that its success was assured.

Mr. LEONARD R. WILKINSON seconded the motion, which was unanimously carried.

Mr. BROOKES acknowledged the vote and complimentary remarks on behalf of himself and his fellow officers, although he said he felt there had been a little exaggerated praise. However, he was sure the whole of the officers had their hearts in their work; and it would be a source of much encouragement to them to know they had retained the good opinion of the Directors and of the shareholders.

BELFAST GAS-WORKS EXTENSION.

The Harbour Board and the Abandonment of the Twin-Island Site.

At the Meeting of the Belfast Harbour Commissioners last Tuesday, the Secretary (Mr. W. A. Currie) read a letter from the Town Clerk (Mr. R. Meyer) on the subject of the negotiations which have been going on between the Council and the Commissioners, or their respective Committees, regarding a site for the proposed auxiliary gas-works. He said he had been directed by the Gas Committee to inform the Commissioners that the Council, at a special meeting held on the 12th inst., rescinded their resolution of the 15th of March last, selecting the site offered by the Commissioners on the East Twin Island, and authorizing the Gas and Law Committees to acquire it. Consequently, the negotiations which had been in progress since then must necessarily be suspended. He added that the Committee recognized the courtesy and consideration extended to their representatives by the Commissioners and their officers during the negotiations.

After the reading of the letter, the Chairman (Mr. R. Thompson, M.P.) offered a few remarks on the attitude of the Commissioners during the negotiations. He said they had been perfectly neutral all through. If they were to consult their own interests only, he would say they would prefer not to have any other public body placing permanent works on the harbour estate, over which the Commissioners wished to maintain perfect control, so as to meet the future wants of either shipbuilding yards or mercantile docks. But when they were approached by the Gas Committee of the Corporation, and asked to grant them a site, they considered it their duty, in the interests of the city, to offer what they thought to be the best and most suitable one at their disposal, and offer it on the most reasonable terms. The heads of the agreement were subsequently drawn up and confirmed by the Board; and if any demand had been made by their Solicitor outside the agreement, it was not by authority of the Board. If any misunderstanding had arisen to mar the progress of the agreement, he thought the Gas Committee knew full well their way back to the Board and thus to have any supposed difficulties amicably arranged, as he would say, on behalf of the Commissioners, that their policy was never to go back on any agreement, either of a public or a private character. He thought these remarks necessary to vindicate the character of the Board from certain aspersions which were suggested at the recent meeting in the City Hall; and, having made them, he would consign the question to oblivion, and venture to hope that it might not be further raised either by the Gas Committee or their friends.

PUBLIC LIGHTING FOR DODWORTH.

Dodworth, an old colliery and agricultural village, has been furnished with a supply of gas from Barnsley for nearly forty years past, but has not hitherto had any street lighting. Now, however, the Urban District Council have adopted an absolutely up-to-date scheme; the installation consisting of the well-known "Falcon" suspended inverted incandescent lamps of Messrs. Hutchinson Bros., Limited. Some few months ago, a Lighting Committee was formed, with Mr. George Briggs as Chairman; and in due course, after visits to various other townships in the district, communications with the Barnsley Gas Company, and consultations with Messrs. Hutchinson Bros., the scheme was submitted to, and approved by, the Council. This provides for the erection of 84 "Falcon" lamps; and as the Barnsley Corporation have agreed to extend their lamps at the borough boundaries, so as to link-up with the lights of Dodworth, the scheme is a very complete one, and covers the district from end to end. The cost will be about £400, which the Council will be able to pay out of current balances, without either resorting to a loan or raising the rates.

The lighting of the first lamp was performed last Tuesday by the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 833.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Apl. 1	5	Alliance & Dublin Ord. .	83—86	+2	5 16 3
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	95—97	−2	4 2 6
200,000	5	May 12	7	Bombay, Ltd.	6⅞—6⅝	..	5 5 8
40,000	5	,,	7	Do. New, £4 paid .	5—5¼	..	5 6 8
50,000	10	Aug. 31	15	Bourne- } 10 p.c. . .	28⅜—29⅜	..	5 1 8
311,810	10	,,	7	mouth Gas } B 7 p.c. .	16—16⅜	..	4 4 10
75,000	10	,,	6	and Water } Pref. 6 p.c.	14⅜—15¼	..	3 18 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	246—249	..	5 0 5
330,000	,,	,,	9⅜	Do. New . . .	184—186	..	5 2 2
50,000	,,	,,	5	Do. 5 p.c. Pref. .	—	..	—
206,250	,,	June 10	4	Do. 4 p.c. Deb. .	99—101	..	3 19 3
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	215—218	+1	5 0 11
246,320	,,	,,	8	Do. A Ord. Stk. .	155—158	+1	5 1 3
460,000	20	Apl. 1	10⅝	British	45—46	..	4 12 4
109,000	Stk.	Aug. 12	6	Bromley, A 5 p.c. . .	117—119	..	5 0 10
165,700	,,	,,	4½	Do. B 3½ p.c. . .	88—90	..	5 0 0
82,478	,,	,,	5⅛	Do. C 5 p.c. . .	106—108	..	5 1 10
55,000	,,	June 29	3½	Do. 3½ p.c. Deb. .	85—87	..	4 0 6
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	97—99	..	4 0 10
100,000	10	—	—	Cape Town & Dis., Ltd.	3—4	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5⅛—6½	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49—50	..	6 0 0
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88—90	..	5 0 0
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord. . .	109½—111½	..	4 9 8
1,513,380	Stk.	,,	5 1/16	Commercial 4 p.c. Stk. .	105—108	..	4 16 3
360,000	,,	,,	5	Do. 3½ p.c. do. .	101—103	..	4 17 1
475,000	,,	June 29	3	Do. 3 p.c. Deb. Stk.	80—£2	..	3 13 2
800 000	Stk.	June 10	5	Continental Union, Ltd.	98—100	..	5 0 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—139	..	5 0 9
492,270	Stk.	—	5½	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk. . . .	104—105	..	3 16 2
148,995	,,	Apl. 1	5	East Hull 5 p.c. Ord. .	96—98	..	5 2 0
486,090	10	July 14	12	European, Ltd. . . .	23⅜—24	..	5 0 0
354,060	10	,,	12	Do. £7 10s. paid.	17⅜—18½	..	4 18 8
16,179,445	Stk.	Aug. 12	4⅝	Gas } 4 p.c. Ord. . .	105—107	..	4 7 2
2,600,000	,,	,,	3⅜	light } 3⅜ p.c. max. .	87—89	..	3 18 8
4,062,235	,,	,,	4	and } 4 p.c. Con. Pref.	103—105	..	3 16 2
4,531,705	,,	June 29	3	Coke } 3 p.c. Con. Deb.	80—82	..	3 13 2
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	92—94*	..	5 6 5
82,500	,,	,,	6⅔	Do. do. 5 p.c.	114—116*	..	5 12 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17—17⅜	..	6 5 9
131,000	Stk.	Sept. 15	7/8	Ilford A and C . . .	145—148*	..	4 19 8
65,780	,,	,,	5⅜	Do. B	112—114*	..	5 3 1
65,500	,,	June 29	4	Do. 4 p.c. Deb. . .	98—100	..	4 0 0

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
4,940,000	Stk.	May 12	9⅛	Imperial Continental .	186—188	..	4 15 9
1,235,000	Stk.	Aug. 12	3⅜	Do. 3½ p.c. Deb. Red.	93—95	+1	3 13 8
200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	120—122	+1	4 18 4
561,000	Stk.	,,	10	Liverpool United A. .	219—221	+1	4 10 6
718,100	,,	,,	7	Do. B . .	161½—163½	..	4 5 8
306,083	,,	June 29	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 29	6	Malta & Mediterranean.	4⅛—4⅜	..	6 4 8
560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb	100—102	..	4 18 0
250,000	100	,,	4⅛	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 27	3⅜	Monte Video, Ltd. .	12½—13	..	5 7 8
1,775,892	Stk.	July 28	4⅜	Newc'tle & G'tesh'd Con	102—103	..	4 5 0
529,435	Stk.	June 29	3⅜	Do. 3½ p.c. Deb.	90—91	..	3 16 11
55,940	10	Aug. 31	7	North Middlesex 7 p.c.	13⅜—14½	+⅜	4 16 7
300,000	Stk.	Apl. 29	8	Oriental, Ltd, . . .	138—140	..	5 14 4
60,000	5	Sept. 15	8	Ottoman, Ltd.	6—6¼*	..	6 8 0
31,800	53	Aug. 31	13	Portsea Island A. . .	131—133	..	5 3 0
60,000	50	,,	13	Do. B. . .	124—126	..	5 3 2
100,000	50	,,	12	Do. C. . .	117—119	..	5 0 10
114,800	50	,,	10	Do. D and E.	99—101	..	4 19 0
398,490	5	Apl. 29	7	Primitiva Ord. . . .	7¼—7⅝	..	4 13 4
796,980	5	June 29	5	Do. 5 p.c. Pref. .	5⅛—5⅝	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
312,650	Stk.	June 29	4	River Plate 4 p.c. Deb. .	97—99	..	4 0 10
250,000	10	Apl. 1	9	San Paulo, Ltd. . . .	15⅜—16¼	..	5 10 9
62,500	10	,,	6	Do. 6 p.c. Pref. .	11⅜—12¼	..	4 18 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	51—52	..	4 16 2
135,000	Stk.	Aug. 31	10	Sheffield A	229—231	..	4 6 7
209,984	,,	,,	10	Do. B	229—231	..	4 6 7
523,500	,,	,,	10	Do. C	229—231	..	4 6 7
70,000	10	May 27	7	South African	11—11½	..	6 1 9
6,429,895	Stk.	Aug. 12	5/9/4	South Met., 4 p.c. Ord.	121—123	..	4 8 10
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	80—£2	+1	3 13 2
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	153—154	..	5 3 11
605,000	Stk.	Aug. 12	3⅝	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	121—123	..	4 1 4
502,310	Stk.	May 12	5	Southampton Ord. . .	110—112	..	4 9 3
120,000	Stk.	Aug. 12	7	Tottenham } A 5 p.c. .	141—143	+1	4 17 11
483,940	,,	,,	5⅛	and } B 3½ p.c. .	112—114	+1	4 16 6
149,470	,,	June 29	4	Edmonton } 4 p.c. Deb.	57—59	..	4 0 10
182,380	10	June 10	8	Tuscan, Ltd.	9—9⅜	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
236,476	Stk.	Aug. 31	5	Tynemouth, 5 p c max.	111—113	..	4 8 6
255,636	Stk.	Aug. 31	6⅝	Wands- } B 3½ p.c. . .	139—141	+3	4 15 9
85,766	,,	June 29	3	worth } 3 p.c. Deb. Stk.	73—75	..	4 0 0

Prices marked * are "Ex div." † Next dividend will be at this rate.

Rev. T. T. Taylor, Chairman of the Council, in the presence of some hundreds of people. Mr. Taylor remarked that for many years they had been looked upon as a poor, lost, benighted village; but that night, at the request of the Council, he was turning upon them a light that would remove this reproach. The scheme had not been brought to fruition without a great deal of thought and trouble; and yet he did not expect that it would please everybody. There were those who said it would be nice to have the light, but that it would increase the rates, and cause their rents to be raised. It should do nothing of the sort. There would be no increase of rates, for the bill would be paid out of the cash the Council had in the bank; and landlords would have no excuse to raise the rents of any person. Of course, there would be the gas to pay for, and the up-keep. Mr. Taylor complimented the Lighting Committee on their work, and said he considered the distribution of the lights throughout the township admirable. The lamp selected was the best gas-lamp he had ever seen, being graceful in appearance by day, and giving a brilliant light at night, without casting shadows, as the old type of lanterns in use did. It was gratifying likewise that this lamp was a local production. Mr. Briggs, in proposing a vote of thanks to Mr. Taylor, said the Committee were highly gratified with the successful consummation of their labours. The lamp chosen was the best and most perfect that could be got for the money—one that would stand all sorts of weather.

THE "DAILY CHRONICLE" AND "COALITE."

Two Further Articles.

In the last issue of the "JOURNAL," there was reproduced the text of an article that appeared in the pages of our daily contemporary for the 19th inst., dealing with some "Startling Facts and Figures as to Coalite," and ending with the words: "So much for Coalite finance. We will deal in another article with the practical position and hopeless conditions which prevail at the various works of the concern."

The second article appeared in the "Daily Chronicle" for last Tuesday, and was headed

Is Coalite a Failure?—Derelict Works—Its Manufacture a Nuisance.

As we have previously shown, one of the most interesting facts in connection with British Coalite is the unquenchable optimism of the Board in the face of disappointments which would certainly depress most commercial men. This possibly may be due to some extent to the inspiring personality of Mr. F. Salisbury Jones, who, though not a member of the Board, appears to have been fully in the confidence of the Directors and to have taken part in the guidance of the Company.

Notwithstanding the fact that British Coalite had a debit balance on working, and that the Company had not fulfilled one of the promises of the prospectus, the Board at the date of the debenture issue were still indulging in flights of fancy and estimates. One would have thought they had had enough of estimates to last a lifetime. The estimates this time were in connection with the batteries which were to be erected in various gas-works, each of which, it was said, would, on the basis of a working arrangement, give to the Company a minimum profit of £5000 per annum per battery. Negotiations were then going on with forty gas companies; and it was hoped to construct at least 500 batteries. All these figures, of course, looked very pretty, and bore a distinct family likeness to the prospectus estimates. But as far as we can ascertain, the Company has only two plants in operation at gas-works; and, judged by the working conditions, there appears very little prospect of anything like £5000 per annum being realized. We will deal with the condition of all the works in detail.

At Wednesfield is situated the factory which has been erected for the purpose of manufacturing plant to be used for the making of coalite. With the brilliant idea in their minds of making 500 coalite plants, to say nothing of plants for abroad, it was perhaps not surprising that the Board decided to erect a huge iron foundry. But it would have shown more discretion to have had two or three plants made by outside people in the first place; so that coalite could be practically tested without incurring enormous expense. The general policy of the Board, however, appears to have been act first and think the matter over afterwards.

COALITE CANNOT COMPETE.

The works have been erected at a cost of about £120,000, and comprise a large foundry, laboratory, carbonizing plant, gasholder, tar distillery, and an electro-chemical plant, part of the power scheme. The coalite plant erected here is too small to give a return upon the capital expended on the works, but quite big enough to meet the demand of the neighbourhood, which is very small. Situated as the works are in the midst of a coalfield, it is possible for coal to successfully compete, while the coal is not particularly adaptable for conversion into coalite.

To sell the coalite at a profit in outside markets is a matter of extreme difficulty owing to the heavy cartage and railway rates.

Having regard, therefore, to the absence of a big demand for coalite plants, either at home or abroad, and to the difficulties associated with the manufacture of coalite at Wednesfield, it is by no means surprising that these big works have gradually fallen into disuse; and it is now generally expected that they will be closed-down. At any rate, the manufacture of coalite there is to cease, owing to the difficulties to which we have referred. The work of the foundry must therefore depend upon the demand on the part of the gas companies for coalite plants; and they certainly do not appear to be falling over one another in their desire to obtain them.

Under the terms of the recent debenture issue, a Managing-Director was to be appointed to superintend the spending of the proceeds of the issue. An American gentleman, it appears, has been appointed to this position; and as his appointment is definitely set forth as being to superintend the spending of the money, it is to be hoped that he will

Richmond's "A.B.C." Gas Fires.

Gas Fire Specialists—

DURING the last few weeks we have shown in our advertisements that our "A.B.C." Series of Gas Fires have very high Radiating Efficiency; that there is continuous interchangeability fire with fire and their superiority is so well known that we need not in this advertisement again refer in detail to their merits, but the fact that so many Gas Authorities have placed them on their hire list and that one of the largest Gas Companies in the country—who adopted them for simple hire 3 years ago—have bought over 7,000 "A.B.C." Fires and to-day have not one in stock returned from their Consumers speaks for itself, and we again invite fullest inquiry, and willingly offer to send any or all of this "A.B.C." series for inspection and testing.

36 sizes, 11 designs, and still all Standardized and Interchangeable Fire with Fire.

THE RICHMOND GAS STOVE & METER CO., LTD., WARRINGTON & LONDON.

INVENTORS OF

Interchangeable Gas Fires, Twin Jet Burner, Oval Fuel, Non-Conducting Air-Packed Fire-Brick; Combination Duplex Tap and Gas-Air Adjuster; Specially Constructed Heat Container, &c., &c., and now Copper or Brass Sheathed Gas Fires.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

see that coalite plants are not manufactured unless there is abundant evidence that they can be profitably employed. This up to date is lacking. Regarding this debenture issue, it would be interesting to know exactly the amount that was subscribed, and how much capital the new Manager has to superintend at the present time.

Quite apart from the profit, if any, which might be made on sales, one is forced to be dubious regarding the success of these coalite plants, for grave complaint has been made that they are a public nuisance; and if that be so, it is quite probable that further heavy expenditure will be necessary for more plant improvement.

A Land Deal.

The Local Authorities of Willenhall and other neighbouring districts have been complaining for some time past of the dense smoke created as the result of the Company's operations, and also of the chemicals, waste acids, and so forth, permeating the air for miles around—to the injury of health. Threats of litigation have been made. Similar complaints have been made regarding the works at Hythe. So that the popularity of coalite plants is open to much question. The land at Wednesfield, it may be mentioned, was sold by Mr. Thomas Parker, the inventor of the process, to the Wednesfield Construction Company for £5065; and the Wednesfield Construction Company sold it to Coalite Limited for £15,500. The Wednesfield Construction Company is not traceable in any of the leading works of reference; so we are unable to say who is associated with it, and why it obtained this excellent profit.

Hythe or Plymouth.

No better fortune appears to have attended British Coalite in connection with its installation of coalite plant at gas-works. Negotiations, it was said, had been opened with forty companies; and the Board spoke glibly of 500 plants. Up to the present, only two have been installed; and one of these has been shut down.

Works were erected by the British Coalite Company at Hythe capable of treating 70 tons of coal per day. These have been shut down; and the Company has reverted to its former methods of high-temperature production.

The position of affairs at Hythe is of abnormal interest to British Coalite shareholders, for the plant installation at the works of the Hythe and Sandgate Gas Company is a typical example of the 500 gas plants which have been talked of by the Board.

The works were installed by the British Coalite Company, and an arrangement was also entered into with the Folkestone Gas Company to take into their mains a proportion of the gas made at the Hythe works.

Shortly after the manufacture of coalite commenced, complaints were made in the surrounding district regarding what was emphatically described as a "stench" by some, and, more picturesquely, by others as a "smell of burning feathers." Neither is a description likely to make coalite plant a popular favourite by the seaside.

Last May the Hythe Borough Surveyor reported that the "stench" had been sufficiently modified so as to be no longer a "great nuisance." But at the same time the Town Council requested that no more coalite should be manufactured until it could be proved that it could be done without causing annoyance. This may be roughly interpreted as without suffocating the visitors.

Coalite carefully pondered the matter, and eventually replied that they did not see why they should be called upon to give an undertaking that they would not be a nuisance to the people near the works; but eventually they agreed that they would suspend operations until September. The reason for making the time-limit September was that the visitors would have left the town by the end of this month. Annoyance to natives presumably does not matter in the least. Still, the point is obvious that the manufacture of coalite is an admitted nuisance; and, this being so, what becomes of the 500 coalite plants? Are there 500 towns which will put up with the nuisance, or has more plant improvement taken place that will remove the operations from the "stench and burning feather stage?" At all events, no coalite has been made at Hythe since May; and the British Coalite Company has a large stock on hand that it would willingly sell at much reduced prices.

Many people have tried it in the neighbourhood, and have found it unsatisfactory; and although efforts have been made to push the sale at all towns within a comfortable distance, the stock remains unabsorbed, although manufacture has been stopped.

If this is an example of the installation of coalite plant at a small gas-works—and there were to be 500 of such installations according to the estimates—is there a ghost of a chance of success?

At Plymouth large coalite works have been erected in connection with the local Gas Company; but as British Coalite has no distillery there, while the demand for coalite is small and repairs and renewals to plant are heavy, it is difficult to see any profit on the deal. Plymouth, in fact, appears to be by no means enchanted with coalite; for the disposition is to reduce the plant rather than to extend it.

Auditors' Comments.

These questions of repairs and renewals to plant and plant depreciation are of most vital importance. So much so that the Auditors of the Company were obliged to make reservations when passing the last accounts. They were passed "subject to adjustment in so far as it affects the dismantling and reconstruction of plant and machinery shown in the balance-sheet, amounting to £153,600, and to a provision for depreciation." This was a fit and proper comment to make, and one which should have been dealt with in detail by the Chairman. But, with the customary disregard for important facts which has always characterized the coalite administration, Sir William Preece dismissed the subject by observing that the Board would, of course, have due regard to the Auditors' request, and would deal with the item in question in future balance-sheets. How on earth are they going to deal with the item? With an increasing debit balance, over-valued assets, and plant standing at an absurd figure, how are they going to deal with the figure in future accounts? We can see no way save reconstruction.

In another article we shall deal with the derelict works at Barking, and with the outlook for the Company.

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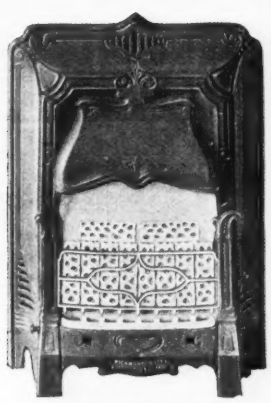
"BAVARIAN" *in 4 Sizes.*



"CASTILIAN" *in 5 Sizes.*

"EGYPTIAN" *in 2 Sizes.*

FINISHES.

Art Black,
Art Bronze Copper,
Porcellanite,
Coloured Enamel,
Hand Wrought
Copper and Brass.

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This third article appeared next day, and was headed

Future of "Coalite"—What is (Not) Happening at Barking—Facts for the Shareholders.

As promised in yesterday's "Daily Chronicle," we give an account of the British Coalite Company's enterprises at Barking.

The British Coalite Works at Barking are another brilliant example of how not to do it. This was the grandiloquent language of the prospectus:

A large freehold site has been secured at Barking, having a valuable frontage to the Thames, and it is intended to erect immediately works capable of treating about 3 million tons of coal per annum for supply in the metropolitan area. These works will be extended as demand requires.

No less forcible in the gift of prophecy was Sir William Preece last December. At Barking the Company was to have a power station which would enable power to be supplied at a price cheaper than that charged anywhere in Europe. Niagara, even, could not touch them in price:

Within a month from now, we shall be making a million cubic feet of gas per day at Barking works alone, to be increased shortly to 3 million cubic feet; and this gas can be converted into electrical power!

Having regard to the miserable straits of the Company up to this date, and to the fact that not a promise of the prospectus had been fulfilled, one would have thought that the Chairman would have been reluctant to enter into the domain of the prophets. But nevertheless those were his expressed views. What are the facts of the case to-day?

DREARY BARKING.

The Company bought, at abnormal prices, land at Barking far in excess of its requirements. There are two jetties; and a large plant has been erected for coal carbonizing purposes. Many retorts were built and shut down as useless long ago; and a tar distillery promised to be completed in August, 1909, was not completed last month. The works were shut down in May, and have not been reopened since. These are the stubborn facts of to-day. A few men are employed tinkering about with the plant; the works are idle; and it appears that no attempt has been made to produce coalite there for months past. A few men appear to be employed unloading coalite, made elsewhere, from barges; and apart from this there is nothing to live for save the hope that work will be recommenced presently to meet the winter trade.

THE ACTUAL POSITION.

It would be well for the Board to face the facts of the case; and if they will not do so willingly, the shareholders had better force them to. Three years' experience has proved that the estimates and prophecies of those responsible for coalite are not worth the toss of a thin sixpence. There is not a single solitary promise which has been made which has come within miles of fulfilment.

Where is the estimated output of millions of tons of coalite? Where is the estimated profit? Where is the power scheme? Where is the possibility of hundreds of gas companies adopting the coalite plant? We could continue to ask questions of this character regarding every promise which has been made by the Company; and echo would always have to answer monotonously, "Where?" It is a matter for the new debenture holders, as well as for the shareholders.

FACE THE FACTS.

One has only to remember that the shares of Coalite Limited were once £44, and are now £3¼, and that the shares of British Coalite have fallen from 22s. to about 6s., and it would be difficult to sell many at that figure, to see where the concern is drifting.

We have set the facts forth in detail; but these figures and this depreciation shriek of failure and reconstruction.

We are now dealing with the possibilities of fuel of the coalite character. It is reasonable to suppose that this class of fuel might become popular in time, and yield profits to the makers of it. But it is quite obvious that profits are never likely to be made by the British Coalite Company until a thorough reorganization of methods has been carried out. For years past, from the date of the original prospectus, shareholders have been fed with ridiculous estimates and anticipations. The present administration has been given a good run; and it has hopelessly failed to justify one single promise.

The system which was sold to the public as a proved commercial proposition is still unsuccessful.

The Company which promised big dividends can show nothing better than a debit balance; and the Board who have been so optimistic in print and in words are, from the point of view of a return to the shareholders, self-confessed failures.

The whole matter is one that requires investigation. Shareholders have not subscribed their money for the privilege of listening once a year to absurdly optimistic remarks which are proved to be wrong almost before the print is dry. The Board and the shareholders had better face facts.

THE PROPOSED EXTENSION OF BIRMINGHAM.

Outside Authorities and the Corporation's Bank Overdrafts.

Readers of the "JOURNAL" are doubtless aware that a project is on foot for the extension of the boundaries of Birmingham, and that parliamentary sanction has been sought for it. The Handsworth District Council, however, are opposed to the scheme, and have issued a report on the subject. In the course of an interview with a representative of the "Birmingham Daily Post," the Chairman of the Negotiations Sub-Committee and of the Parliamentary Sub-Committee of the Boundaries Committee of the Corporation (Mr. A. D. Brooks) stated that the essence of the scheme was an amalgamation or partnership between

Entirely New Departure for "A.B.C." Fires.

Gas Fire Specialists—

FOR high-class dwelling-houses where ordinary Art Black will not be appropriate owing to the present vogue for oak panelling and oak parquet flooring in some rooms, and for copper fittings, fire curbs, pendants, &c., we have introduced an entirely novel departure in our "A.B.C." series—illustrations of 5 new designs are opposite. The Fires are entirely sheathed in Copper or Brass and are extremely handsome, and are suitable for the most elaborately furnished rooms; but other designs will readily be submitted on request. These additions to our "A.B.C." series now make

36 sizes, 11 designs, and still all Standardized and Interchangeable Fire with Fire.

THE RICHMOND GAS STOVE & METER CO., LTD., WARRINGTON & LONDON. INVENTORS OF **Interchangeable Gas Fires, Twin Jet Burner, Oval Fuel, Non-Conducting Air-Packed Fire-Brick; Combination Duplex Tap and Gas-Air Adjuster; Specially Constructed Heat Container, &c., &c., and now Copper or Brass Sheathed Gas Fires.**

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

Birmingham and the other districts which physically formed part of Birmingham, on terms which should be fair to all parties. In the Provisional Order, there was a clause providing that each district should pay its own debts and liabilities up to the time the scheme came into operation, and, if necessary, should levy a rate for the purpose. The object of the clause was to bring Birmingham and the outside districts on to an equal footing in regard to current debts. Therefore, apart from these special liabilities, Birmingham had made full provision in the current estimates for all liabilities up to March 31 next, the end of the financial year, except in regard to the overdrafts on the gas and water undertakings. On the gas account, there was an overdraft on March 31, 1910, amounting to £224,000, and it had been in existence for many years. More than half of it was taken over from the old Gas Companies in 1875; and it should be made clear that those Companies, under their Private Acts of Parliament, had power to borrow moneys for the general purposes of their undertakings, including the raising of money from bankers for working capital. It was impossible that a great trading undertaking like the Gas Department could be carried on without a certain amount of liquid capital. As against the outstanding overdraft of March 31, 1910, the Corporation had, in what might be described liquid assets, £140,000 representing coal and other stores, £169,000 odd in respect of gas and fittings rentals, and upwards of £72,000 on other sundry accounts; making a total of £382,000. So there should be no apprehension in the minds of the ratepayers in regard to the matter. Business men would clearly grasp the situation that, in carrying on such a huge undertaking, it might be necessary to obtain accommodation at the bank. The stability of the gas undertaking was further assured by the fact that a reserve fund of £100,000 had been set apart, and invested in trustee securities outside the Corporation funds. Attention had been drawn to the recent decision of the High Court in the West Ham case, to the effect that the borrowing of money from a bank for the purpose of municipal trading was illegal. It was extremely doubtful, Mr. Brookes urged, whether this decision applied to the special circumstances existing in Birmingham. He thought that it was obvious, if the outside districts joined with Birmingham and received the benefit of the Birmingham undertakings, they should be prepared to share in the responsibilities which had arisen in connection with the carrying on of the undertakings.

LINCOLN CORPORATION WATER SUPPLY.

Commemoration Stone Laid at the New Water-Works.

Readers may remember that about two years ago a commencement was made with the new water scheme for the supply of Lincoln for which the Corporation had just obtained parliamentary powers. The works are situated at Elkesley, about 22 miles from the city in a westerly direction; and they comprise boreholes and pumping plant by which the water will be raised and sent to a tank at Westgate, near the Cathedral, whence it will gravitate to a new reservoir on Cross-o'-Cliff Hill. The scheme, which will cost about £200,000, has been prepared by the Water Engineer (Mr. Neil M'Kechnie Barron), and is being carried out under his supervision. The works were recently visited by the Mayor (Mr. C. T. Parker), members of the Corporation, and a number of officials and guests, to witness the laying of a commemoration stone in connection with the undertaking.

On arriving at the site, Mr. Barron, on behalf of the Contractors, the Resident Engineer, and himself, expressed their appreciation of the presence of the Mayor and visitors. He said the Mayor, as Chairman of the Water Committee, was in full possession of all the facts relating to their scheme of water supply, and he would presently give them some very interesting particulars regarding it. He would also be able to tell them how soon it was anticipated the new water would be at Lincoln, which, after all, was the most important fact. Mr. Barron then proceeded to give a description of the buildings. In addition to the main one, comprising the engine-room, workshop, boiler-house, &c., there are three workmen's cottages at one side, and on the other is the Engineer's house, containing a Committee-room for the convenience of members of the Council, the Town Clerk, and others, who visit the works from time to time. Mr. Barron said the next time they visited the works they would present quite a different appearance, as the work was very forward, and in two months at the latest the roofs would be on, and they would commence the erection of the pumping machinery. In conclusion, he asked the Mayor to lay the stone to commemorate the occasion; and in order that he might perform the task well, and lay the stone truly, he said he had much pleasure in presenting him with a mallet on behalf of the Contractors (Messrs. Crane, of Nottingham), and a silver trowel on his own behalf.

The silver plate on the mallet bore the inscription: "Presented to the Right Worshipful the Mayor, Councillor C. T. Parker, on the occasion of his laying the Commemoration Stone at Elkesley Pumping Station, September 14th, 1910, by the Contractors, William Crane, Ltd., Nottingham." On the silver trowel was precisely the same inscription with the exception that it was "presented by Neil M'K. Barron, Water-Works Engineer. The stone was inscribed as follows: "Erected in the Year 1910, in the Mayoralty of Chas. Thomas Parker. W. T. Page, Town Clerk. N. M'K. Barron, Engineer."

The Mayor then performed the ceremony of laying the stone. After testing it with the spirit-level, he declared the stone "well and truly laid." He then proceeded to give the following particulars in regard to the works. He said that since they were commenced four boreholes had been completed to a depth of 600 feet. A prolonged test had been made of the quantity and quality of the water available, and it had proved entirely satisfactory. The difficult foundation work connected with the works necessary to deliver the water had now been completed, and the superstructure was rising rapidly. The buildings would soon be roofed in, enabling the Engineers to commence the erection of the powerful machinery necessary to raise the water to Lincoln. The pumping plant was entirely in duplicate, and consisted of two triple-expansion surface condensing engines, each of which would work

"ARABIAN" *in 5 Sizes.*

"BAVARIAN" *in 4 Sizes.*

"CASTILIAN" *in 5 Sizes.*

"EGYPTIAN" *in 2 Sizes.*

FINISHES.

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Porcellanite,
Coloured Enamel,
Hand Wrought
Copper and Brass.

"DOG GRATE" *in 3 Sizes.*

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two borehole pumps; raising the water from a maximum depth of 300 feet into tanks just beneath the level of the ground. The water would be lifted from these tanks by high-lift pumps, of which there were three to each engine, and forced through the rising main to the water-tower at Lincoln. A Venturi meter had been installed between the high-lift pumps and the rising main; the diameter being reduced to 4½ inches. The whole of the straightforward work on the pipe-line had been completed—*i.e.*, 20 miles of cast-iron pipes, 21 inches in diameter, had been laid and tested. The remaining two miles was made up of special work at the crossing of rivers, and other obstacles, including the large crossing at the River Trent, where the main was carried by a new steel bridge in six spans. At the end of the main at Lincoln would be the new water-tower, 106 feet in height, containing a large steel tank holding 300,000 gallons. This tank would be for the supply of the high-level district in the vicinity of the Cathedral, and for some considerable distance around it. All the water would be pumped through this tower; and the surplus, after the supply to the uphill district had been given, would pass by gravitation through the city by means of a new main to the new large reservoir in course of erection on Cross-o'-Cliff Hill. This would hold 6 million gallons of water, or sufficient for two days' storage of 3 million gallons a day, on which basis the whole of the works had been designed. Even should a continuance of bad weather interfere with the progress of the work, he had it on the best authority that his successor would turn on the tap during his year of office—probably in September. In conclusion, the Mayor paid a tribute to Mr. Barron and Mr. Mitchell, the Resident Engineer at Elkesley, who were doing their best to carry the work to a successful issue.

A vote of thanks having been accorded to the Mayor, he invited the company to tea, in the preparation of which some of the new water was used. At the close of the repast, the party returned to Lincoln.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Eastern District of the Scottish Junior Gas Association made an auspicious beginning of their winter session this afternoon, when they discussed the address of the new President—Mr. Walter Dunlop, of Kirkcaldy. There was only one honorary member present, in the person of Mr. J. W. Napier, of Alloa. He had shown his great interest in the Association by coming to take the place of Mr. J. Falconer King, of Edinburgh, another honorary member, who was to have addressed the meeting, but who was unable to be present. Mr. Napier was a host in himself, and led off the discussion upon lines which made it easy for the members to keep up. A good start in a discussion is always of importance; and this Mr. Napier gave this afternoon. The readiness of the members to give voice to their opinions was a very pleasing feature of the meeting. Two other items were also exceedingly pleasing—one the addition of ten new members to the roll of the Association, and the other the list of preferments which have come to members during the present year. The record is one at which the Association may well be gratified, and all the members should be proud to belong to it.

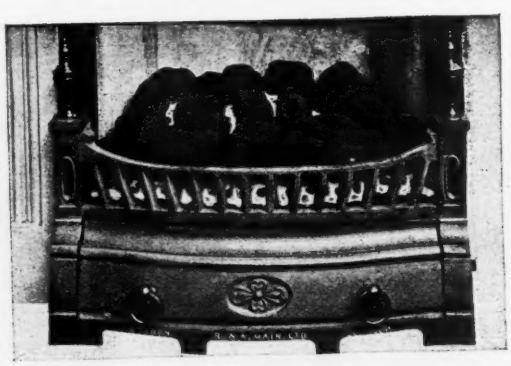
In the Falkirk Town Council on Monday, there was submitted a minute of the Gas-Works Committee, dated Sept. 13, in which it was stated that the rates for gas were fixed at 2s. 10d. per 1000 cubic feet for lighting (ordinary meters) and cooking; 3s. 3d. for prepayment meters and cookers; and 2s. 5d. for motive power. Bailie Bogle, the Convener, moved approval of the minute. He said the members would observe that the gas-works were this year in the best position in their history; and the Committee proposed to take 2d. per 1000 cubic feet off the price of the gas. This, combined with free cookers, made practically a reduction of 3d. per 1000 cubic feet. If it had not been for the fact that they had had to pay £700 more for local taxes, and £100 more for income-tax, they would have been able to make a much larger reduction. Twelve years ago, the price of gas was 3s. 9d. per 1000 cubic feet; now it was practically 2s. 9d. This he thought was very satisfactory. Mr. H. Russell suggested that they should remit the part of the minute relative to the price back to the Committee for re-consideration, because, so far as he could see, there should be a larger reduction. He had looked into the working analysis of last year, and there certainly was an improvement, when he compared it with former years. Unless, then, there was something he failed entirely to understand, they would be justified in making a larger reduction. If they took the year 1903-04, when gas was sold at the same rate as it was at the present time—viz., 3s. per 1000 cubic feet—they would find that in that year the price of coal per 1000 cubic feet of gas sold was 16·99d., while last year it was 14·09d. Therefore, in round figures, they had this year a reduction of 2½d. in the price of coal; and they had received 3d. per 1000 cubic feet more for bye-products, due to better markets. If they compared last year with the year in the history of the old gas-works when the price of gas was the same as it was at the present time, they would find that whereas in the former year, when hand-charging was used, the rate of wages was 4·056d. per 1000 cubic feet of gas sold, last year it was 2·7d. per 1000 cubic feet sold. It was nearly 2d. more in the old days. Then, again, rates and taxes last year were just over 4d. per 1000 cubic feet of gas sold; while in the year he had put it against, they amounted to 4·653d. It was, however, fair to say that interest and sinking fund contributions had increased. Last year these were 13·21d. per 1000; in the previous year, they were 11·5d. Taken all over, there was a clear gain of something like 5d.; and they were now producing a cheaper quality of gas—14-candle instead of 20 or 21 candle. On the face of these facts alone, he thought that the Committee should look into the matter more minutely. The Council unanimously sent the question back to the Committee.

The classes upon "Gas Manufacture" and "Gas Distribution and Supply," conducted by Mr. H. O'Connor, F.R.S.E., of Edinburgh, in the Glasgow and West of Scotland Technical College, were opened last night (Friday). They used to be held on Saturday evenings. This year it has been decided by the College authorities that the courses in

THE "MAIN"
"ST. NICHOLAS" INTERIOR FIRE

INTRODUCED BY US LAST YEAR.

HAS ALREADY BEEN COPIED.



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MELBOURNE: 333-335, Queen Street. *'Phone No.:* 3716.

both subjects shall conform more closely to the syllabus of the City and Guilds of London Institute, so that the courses this year will consist of a series of lectures preparing for the ordinary grade examinations. Mr. O'Connor's class on "Gas Manufacture" in the Heriot-Watt College, Edinburgh, opens next Thursday.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 24.

Sulphate of Ammonia.

A fair volume of business has been transacted during the past week; and, although there has been no appreciable advance in values, makers have found no difficulty in disposing of their present output at full prices. The quotations at the close are £12 11s. 3d. to £12 12s. 6d. per ton f.o.b. Hull, £12 12s. 6d. to £12 13s. 9d. per ton f.o.b. Liverpool, and £12 13s. 9d. to £12 15s. per ton f.o.b. Leith. No new business has transpired for delivery next year; but it is reported that further orders have been placed for shipment in equal monthly quantities October, November, and December this year at prompt values.

Nitrate of Soda.

The market for this article is rather quiet, but very steady at 9s. 4⅛d. per cwt. for ordinary and 9s. 7⅛d. for refined quality, on spot.

LONDON, *Sept.* 26.

Tar Products.

The markets have been steady throughout the past week. Pitch has been quiet without very much business doing. But there has been very little change in prices; and what there has been is rather in the downward direction. Creosote is steady, and orders are difficult to secure. The majority of makers, however, look for better demand at an early date. Benzols are quiet. There is some demand for prompt delivery; but for forward, buyers' ideas are very much under those of makers, and business is therefore impossible. In toluol, there is little demand, and prices asked by makers are somewhat above the ideas of consumers. Solvent naphtha is steady. But orders are very difficult to secure as consumers are being pressed to buy for delivery over a long period ahead; and they naturally think that by waiting they will do better. Carbolic acid is quiet. Continental consumers decline to offer more than 1s. 0⅛d. per gallon; but makers on this side report having received offers at 1s. 0⅛d. Cresylic acid is steady, and there is a fair demand for this article. Naphthalene is steady without very much business doing. Creosote salts are in good demand. Tar is still maintaining its value.

The average values during the week were: Tar, 18s. 9d. to 22s. 9d. *ex* works. Pitch, London, 37s. to 37s. 6d.; east coast, 37s. to 37s. 6d.; west coast, 35s. 6d. to 36s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7d. to 7¼d.; North, 6⅞d. to 7d.; 50-90 per cent., casks included, London, 7⅛d. to 7⅜d.; North, 7¼d. Toluol, casks included, London and North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3⅜d. to 3¼d.; solvent naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s.; heavy naphtha, London, casks included, 11d. to 11½d.; North, 10⅜d. to 11d. Creosote, in bulk, London, 2⅜d. to 2½d.; North, 2d. to 2¼d. Heavy oils, in bulk, 2⅜d. to 2⅝d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been exceedingly firm during the past week, and prices have advanced all round. The Gas Companies to-day quote £12 6s. 3d. for the 25 per cent. min.; while London makes are £12 2s. 6d. to £12 3s. 9d. In Hull, £12 12s. 6d. has been declined, and £12 15s. has been paid for one of the best makes. In Liverpool, £12 15s. has been paid; and in Leith this figure is reported to have been refused for prompt delivery. Middlesbrough is quoting £12 15s.

COAL TRADE REPORTS.

Northern Coal Trade.

The unrest in the coal trade has made prices very uncertain for some days; but they are now returning to something like the normal values. In the steam coal trade, best Northumbrians are from 9s. 7½d. to 9s. 9d. per ton f.o.b., second-class steams are about 8s. 9d. to 9s., and steam smalls are from 5s. 6d. to 6s. 6d. The output is now well maintained, and so far seems to be taken up fairly; but the demand for some of the Baltic ports is showing the decrease which is customary at this season of the year. In the gas coal trade, the home request is now steadily increasing; and the deliveries to the great consuming companies are much above the rate of two months or so ago. Durham gas coals vary in price according to the quality. The usual classes are from 9s. to 9s. 9d. per ton f.o.b.; while for "Wear specials," from 10s. 3d. to 10s. 6d. is the current quotation. There were no contracts of moment settled in the last few days. But some sales for export continue to be made, more especially for some of the Mediterranean ports; and the basis of the sales is about 16s. per ton for gas coal delivered at Genoa. In the coke trade, the demand is steady; but the increase of the output of gas coke is making its price easier. The current quotation for good gas coke is from 13s. 9d. to 14s. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade continues dull; prices being very inelastic, and the foreign trade very much at a standstill. The prices now quoted are: Ell, 8s. 9d. to 10s. per ton f.o.b. Glasgow; splint 9s. 6d. to 9s. 9d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 322,183 tons—a decrease of 2173 tons upon the preceding week, and of 5705 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,460,397 tons—an increase of 715,770 tons upon the corresponding period.

ROTARY WASHER SCRUBBER.

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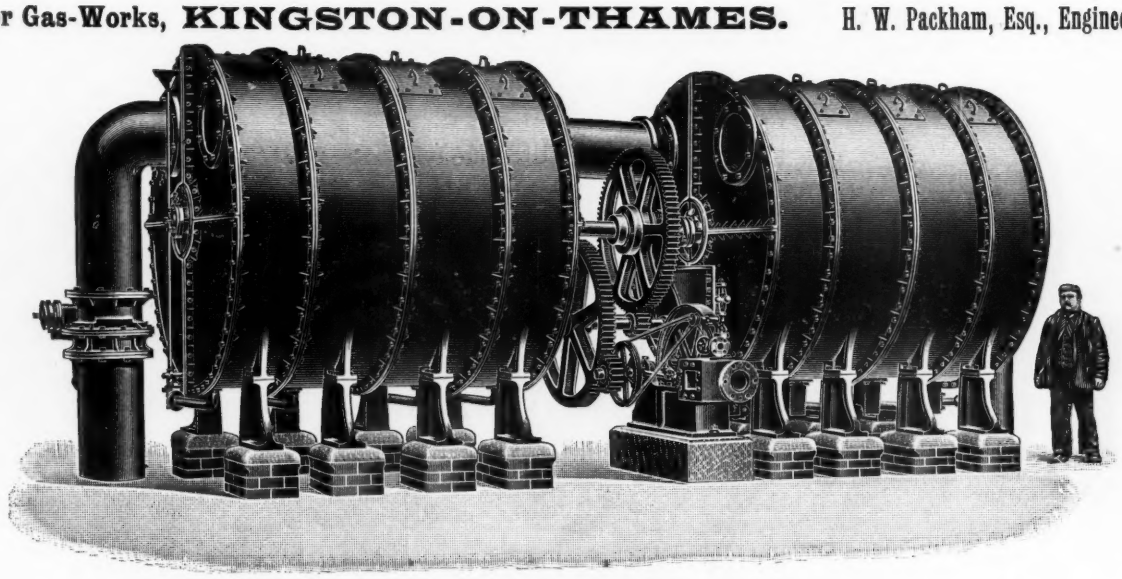

MAKERS:

R. & J. DEMPSTER, Ltd., MANCHESTER.

London Office:

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Oswaldtwistle Water Supply.—The Oswaldtwistle Urban District Council have received the sanction of the Local Government Board to borrow £2396 for the contract for sand filters, &c., at the Cobbs reservoir, and £377 for the purchase of land as a site for sand filters at the Jackhouse reservoir.

Reductions in Price.—The Isle of Thanet Gas Company have reduced the price of gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet as from the 1st prox. The Torquay Gas Company have lowered their price 1d. per 1000 cubic feet, with a rebate equivalent to twice the amount to prepayment consumers, as from Michaelmas.

Gas Supply in Paris Suburbs during the Floods.—At the time of the floods in Paris in the early months of the present year, the Paris Gas Company assisted the Company supplying the suburbs, whose works were several feet under water, in maintaining the service by furnishing them with about 281 million cubic feet of gas. The Municipal Council, as the owners of the Paris Gas-Works, have authorized the Company to charge for this gas at the rate of 3s. 5d. per 1000 cubic feet. It will consequently cost the Suburban Company about £48,000.

Johannesburg Water Supply.—Some of our readers may remember that the water supply of Johannesburg is in the hands of the Rand Water Board, who also serve other municipalities along the Reef and the Rand Mines. They are Krugersdorp, Germiston, Benoni, Boksburg (Roodepoort-Maraisburg), and Springs. The area supplied is 365 square miles, and the population 365,442. The water pumped per annum is 1685 million gallons. It is obtained from the Dolomite formation, and has to be raised about 800 or 900 feet to control the various districts. The pumping plant for the boreholes is electrically driven; but at the central station the motive power is a series of triple-expansion engines driving direct-acting inverted vertical pumps. Mr. W. Ingham, late Engineer-in-Charge of the Smart Syndicate Irrigation Farms, Britstown, Cape Colony, has been appointed Chief Engineer to the Board.

Improvements at St. Mary Church Gas-Works.—An application by the Torquay Town Council for sanction to a loan of £4250, for improvements in connection with the gas-works at St. Mary Church, was the subject of an inquiry by Mr. A. A. G. Malet, a Local Government Board Inspector, last Thursday. The Town Clerk (Mr. F. S. Hex) explained that £500 of the sum was required for a new sulphate house and workshop, £250 for meters and services, £500 for cookers, £1000 for mains, and £2000 for slot installations. Owing to the degeneration of the plant in the existing sulphate-house, which had been in use for twenty years, a breakdown was feared; and as a new house was a pressing necessity, the Council had been obliged to proceed with the matter. Mr. F. Chalmers, the Gas Manager, explained in detail how it was proposed to deal with the loan, and said the extensions and improvements were needed mainly because of the growth of small properties for the artizan class, and the consequent increase in the number of prepayment consumers.

A Gas Debenture Stock Anomaly.—In a letter in last Friday's "Financial Times," under the heading of "A Gas Debenture Stock Anomaly," the following remarks appeared: "The Gaslight and Coke Company and South Metropolitan Gas Company 3 per cent. debenture stocks are quoted in both cases at 80 to 82; whereas the Wandsworth and Putney Gas Company 3 per cent. debenture stock is quoted at 73 to 75. The security in all three cases is unquestionable. Why, therefore, should there be such a wide difference in the prices?"

Mannesmann Tubes for High-Pressure Gas.—At a recent meeting of the Burnley Town Council, it was recommended that a 5-inch high-pressure gas-main should be laid in the town; the tubes proposed to be used being Mannesmann steel tubes with rigid joints, coated with a special coating. The chief reason for adopting this class of pipe was that it was not liable to be broken by subsidence of the ground, which caused considerable trouble with ordinary pipes. Then the lead joint adopted with cast-iron pipes was susceptible to the movement of the ground, and leaks resulted; but the joint in the steel pipes was practically an extension one. They had been used with success in districts in which subsidences occurred; and in soil of a corrosive nature they were found to be more durable than cast-iron pipes. The recommendation was adopted.

Roads Improved by Tar Spraying.—Reference was made at the meeting of the Devon County Council last Thursday to the advantages of tar spraying the roads. According to some members of the Council, the roads are the worst in England, owing to the use of limestone and other soft material which is comparatively easy to break. Tar spraying is, however, found most beneficial where it is in use. Dr. Mackenzie said his experience was that it was most useful. It prolonged the life of the roads, and relieved a great deal of the dust nuisance. The inhabitants of the villages were in favour of its continuance. Mr. Davie, corroborating this view, said he had had the road outside his property sprayed at his own expense; and instead of being smothered with dust as hitherto, he had been absolutely free from it. It was, however, very necessary that before a road was sprayed, it should be in thorough order.

Improved Public Lighting in Stoke Newington.—At the meeting of the Stoke Newington Borough Council last Tuesday, the Highways Committee reported having had under consideration an offer by the Gaslight and Coke Company to instal, at their own cost, inverted in place of the existing upright incandescent burners in the street-lamps in the borough, and to maintain them in thoroughly efficient order at prices (for the supply of gas and maintenance) which will effect a saving of £250 in the present annual cost to the Council for street lighting, while the illuminating power of the lamps would be increased by 20 per cent., provided the Council enter into a contract with the Company for five years at the fixed prices quoted by them. If at the expiration of this period the contract is renewed for another five years, a further reduction in price will be made, effecting an additional saving of £103 per annum. On the recommendation of the Committee, the Company's offer was accepted.

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Shop Lighting.—In the "Trade Chat" in the "Ironmonger" for the 17th inst., "Vulcan" offered the following remarks on the subject of shop lighting: "Next in importance to window display and the presentation of interesting details about one's goods, is the lighting of the shop window. In most towns, tradesmen now have the option of using either electricity or gas; and there is no longer any excuse for leaving the exterior or interior of one's premises in a condition resembling the 'twilight of the gods.' Ironmongers who do gas-fitting as well as electric wiring, and sell fittings and accessories for both styles of lighting, should illuminate their shops partly with one and partly with the other method, so as to give the rival systems an impartial show. But whichever agent is selected, brilliant lighting inside and out should be insisted on."

Quality of Truro Water.—Attention is again directed to the suspicion attaching to the water supplied for domestic purposes in Truro. A sample recently submitted by the Town Council to Mr. Kitto for examination was found by him to give unsatisfactory results; and the suggestion was made that the filtration was not efficient. The Town Council, in forwarding the report to the Water Company, suggested that notices should be issued warning the public to boil the water before using it. In reply, the Company deprecated any action which would have the effect of raising a scare; and they explained that samples of the water were about to be submitted for analysis, as was done every quarter, and they proposed to put off the issue of notices until the result of the examination came to hand. It was explained that for several months past the Directors had been consulting competent authorities on questions of water supply, but had been unable to determine which would be the most suitable and efficient scheme to adopt for the improvement of the works. At their last meeting, the Council discussed at some length the Company's reply, and decided not to insist for the present on the issue of warning notices.

North Warwickshire Water Company.—At the annual meeting of the Company, which was held last Thursday—Mr. R. Barnes presiding—the Directors reported a further increase in revenue to the amount of £245; the number of new services laid on having been 186. In consequence of the regretted death of Mr. Joseph Quick, the Board had appointed Mr. H. G. Perryn as Consulting Engineer. He visited the works in March last, and reported that the pumping-station, machinery, reservoirs, and other works were efficiently maintained. The Chairman, in moving the adoption of the report, said it was a matter of great satisfaction that there had been an increase in the rentals which had converted a loss last year into a profit this year. In addition, there had been a saving of nearly £200 in the working expenses. The profit on the trading this year had been £1131, as against £784 last year, which was a marked improvement. It was also very satisfactory that, in the Knowle district, to which the Company extended their main some time ago, the services were gradually increasing. They had several very good applications for supplying large districts which were developing; and it was hoped the Company would soon be supplying them. The report was adopted unanimously.

Dearer Electricity in Marylebone.—As a result, according to the "Daily Mail," of the growing use of metallic filament lamps, the Metropolitan Electric Supply Company, Limited, have raised the price of electricity to the private consumers from 5½d. to 6d. per unit, with a reduction of 4d. on every unit above the quantity hitherto used.

An Automatic Installation for Rainford.—The Rainford Gas Company (Lancs.) have placed a contract with the Richmond Gas Stove and Meter Company, of Warrington and London, for the supply of complete automatic installations, including meters of Messrs. George Glover and Co.'s make. Canvassing and up-to-date literature have resulted in nearly 400 houses being fitted.

Electricity Supply in West Ham.—The Local Government Board have granted the application of the West Ham Corporation for a loan of £118,525 for extensions of the electricity works. It is proposed to expend, after deducting £74,600 on account of a previous application, £20,900 for a 3000-kilowatt turbo-alternator, a boiler, extension of the coal-handling plant, condenser, and switch gear. The balance will be used for new mains and services, and for motors on loan. During the twelve months ended March 31 last, the Corporation disposed of 19,156,399 units at prices ranging from 0·93d. to 3d. per unit.

Bexhill Water and Gas Company.—The accounts of this Company for the six months ended the 30th of June show a balance of £4557 available for distribution; and at the meeting of shareholders on Thursday the Directors will recommend dividends at the rates of £6 and £4 4s. per cent. per annum on the two classes of capital, less income-tax. This, with provision for income-tax, will absorb £3426, and leave £1131 to be carried forward. The Directors remark that the reduction in the price of gas mentioned in their report this time last year, necessarily caused a diminution in the profit from sales; and though the consumption is increasing, it has not yet produced an equivalent return. This, coupled with a heavy increase in local rates, has so far affected the result of the half-year's working as to induce them to recommend a reduced dividend, which they hope will be only temporary.

Reduction of Price at Torquay.—A very satisfactory report was presented at the half-yearly meeting of the Torquay Gas Company, which was held last Tuesday under the presidency of Mr. W. B. Beynon. The accounts presented by the Secretary (Mr. R. P. Kitson) showed that the receipts amounted to £13,721, compared with £14,303 before; and the expenditure was £999, against £10,283. The balance on the profit and loss account was £4404; and after deduction of the amount necessary to pay the usual dividends of 10 and 7 per cent., there remained a balance of £1008. In view of this satisfactory state of affairs, the Directors felt justified in reducing the price of gas to ordinary consumers from 2s. 11d. to 2s. 10d. per 1000 cubic feet as from Michaelmas; while on prepayment meters a rebate of ½d. in the shilling will be allowed, which is equivalent to a reduction of 2d. per 1000 cubic feet. Mr. Iredale pointed out that the reduction would represent a total sum of £900, and said that in Torquay there were 2500 slot-meter consumers.

PURE HEAT!

"PURE HEAT" is the title of our new booklet which explains in detail how heat as pure as that from the SUN is obtainable by using our "SYPHON STOVES." It also enumerates the many convenient uses to which they may be put.

Many important improvements in finish have been made, and in every way these Stoves are thoroughly RELIABLE, EFFICIENT, AND HYGIENIC.

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ACADEMY STREET, WARRINGTON.
Telegrams: "GASTOVES, WARRINGTON."
Telephone: WARRINGTON 80.

We have received from the Carron Company, of Stirlingshire, their new gas-fire booklet for the season. It contains particulars and prices of a number of gas-fires in various finishes; also of the Company's gas-heated steam radiators and hygienic induction condensing gas-stoves.

The Ryde Town Council have accepted the tender of Mr. John M'Kay, of Derby, at the sum of £1642, for extending the water supply of the borough at Niton, in consequence of the voluntary winding-up of Messrs. A. E. Nunn and Co. The amount named has reference to the completion of the principal works; the remainder being subject to schedule prices.

Messrs. Fletcher, Russell, and Co., of Warrington, are issuing a supplementary list of new season's gas-fires, &c., for insertion in List No. 246, so as to bring it up to date. The firm have also prepared a new fire pamphlet, a gas-radiator pamphlet, and a descriptive booklet of their new pattern water-heaters. Being well printed, and in attractive covers, these are eminently suitable for distribution among present and prospective gas consumers.

The Burnden Tar Company (Bolton), Limited, are, as from the 1st prox., entering into new works (to be known as the Hulton Chemical works, near Bolton), which have been erected with up-to-date plant for tar distilling on a large scale, and are transferring their name, together with their business connection, thereto. There are private sidings to the works; and an important feature is that the tar-stills have a working capacity of 30 tons each.

The catalogue of the New Inverted Incandescent Gas-Lamp Company, Limited, for the 1910-11 season, of which we have received a copy, shows the well-known "Nico" burners and mantles in great variety for factory, mill, domestic, and outdoor lighting. A very good illustration of the use of "Nico" burners for church illumination will be found on the last page. A large portion of the catalogue is devoted to brackets, pendants, lighting accessories and fittings, glassware, &c. The illustrations and descriptions of the Company's goods occupy upwards of a hundred large quarto pages, and reference to them is facilitated by an index.

An appeal by the Street Urban District Council on behalf of the gas consumers who use slot-meters has failed. Other consumers are to be allowed discount for prompt settlement of accounts; and Street protested against the slot-meter users being ignored—pointing out that obviously no one paid more promptly. Mr. D. E. Garlick, the Secretary and Manager to the Glastonbury Gas Department, has written: "It must be remembered that consumers by ordinary meter pay rent for meters and stoves, and pay the cost of installations, fittings, &c., within their premises. Consumers by slot-meter pay no rent for the meters; and, in the great majority of cases, the fittings and installation have been provided by the Gas Committee. Though the nominal price of gas in these cases is 4s. 7½d. per 1000 cubic feet, it is necessary to deduct the rent of the free fittings and meters; and the actual net receipt spread over a number of years works out at 4s. per 1000 feet only. Where gas-stoves are also provided free, the gas is charged at 5s. 2½d. per 1000 cubic feet; but the net return to the Gas Committee, after deducting the usual rent, again averages 4s. per 1000 feet. It will thus be seen that the consumers by slot-meter are placed in a very favourable position as compared with the other small consumers (who are charged 4s. 6d. per 1000 cubic feet, subject to a discount of 2d., for payment on or before the 10th of the month following the date on which the quarterly account is sent out); and while the Committee will do everything in their power to make further reductions in price when financial considerations permit, they do not consider that the claims of the slot-meter consumers can be said to be greater than those of customers who take their gas by ordinary meter.

APPLICATIONS FOR LETTERS PATENT.

21,152.—Richmond Gas Stove and Meter Company, Ltd., and Ransome, J. A., "Gas-heated air-heating and ventilating stoves." Sept. 12.
21,171.—Snell, A. C., "Taps and valves." Sept. 12.
21,173.—Westaway, J., and Hellyar, W. A. S., "Connecting devices for gas-pipes." Sept. 12.
21,184.—Higgins, W., "Manufacture of gas." Sept. 12.
21,210.—Mueller, W., "Treatment of, and recovery of, bye-products from distillation gases." Sept. 12.
21,222.—Yates, H. J., "Gas-controlling apparatus for heating and other appliances." Sept. 12.
21,286.—Summers, W., "Controlling the flow of liquids." Sept. 13.
21,287.—Faiers, M., "Gas-tap." Sept. 13.
21,313.—Billè, L., "Joints for conduits." Sept. 13.
21,358.—Yarrow, M., "Joints of pipes and mains." Sept. 14.
21,375.—Rosenhain, W., "Detecting presence of gas." Sept. 14.
21,391.—Roberts, F. & M. P., "Generation of gas." Sept. 14.
21,404.—Higgins, W., "Gas-generating apparatus." Sept. 14.
21,407.—Pinel, W. P., "Chimneys for mantles." Sept. 14.
21,409.—Rotermund, H., "Recovery of ammonia from gas." Sept. 14.
21,425.—Girling, A. H. G., "Clip for pipe-joints." Sept. 15.
21,443.—Glover, R. B. G., "Inverted burners." Sept. 15.
21,461.—Sutherland, A. G., "Prepayment meters." Sept. 15.
21,481.—Watkinson, J. G., "High-pressure gas-lamps." Sept. 15.
21,508.—Lake, H. W., "Gas and air mixing plants." A communication from the firm Selas G. m. b. H. Sept. 15.
21,527.—Weatherhead, F. W., "Acetylene generators." Sept. 16.
21,546.—Provincial Cinematograph Theatres, Ltd., "Holding and shading gas-lights." Sept. 16.
21,568.—Robin, J. T., "Packing mantles." Sept. 16.
21,624.—Pollatschek, E. B., "Incandescent burners." Sept. 16.
21,631.—Whitfield, C., "Gas-producers." Sept. 17.
21,644.—Pryor, H., and London Vertical Retort Syndicate, Ltd., "Utilizing the waste heat of retort or other furnaces." Sept. 17.

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The Cardiff Water Committee received twelve tenders for the construction of their new Llwyn On reservoir. Of these, seven were below £240,000—the lowest being £201,000. The Committee decided that the Water Engineer (Mr. C. H. Priestley) should go through the whole of the tenders and make a report to the next meeting of the Council.

From an announcement appearing in our advertisement columns, readers will see that Messrs. John E. Pritchard and Co. (successors to Messrs. Alexander, Daniel, and Co., of Bristol) will offer for sale on the 6th prox. £15,000 of 7 per cent. maximum consolidated ordinary stock of the Bristol Water-Works Company, in lots of £100, at the reserved price of £136 each.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WORKING MANAGER (WATER-WORKS). Beaumaris Corporation. Applications by Oct. 4.
WASTE INSPECTOR. Colne Valley Water Company.
GAS LEAKAGE DETECTOR. Rhondda Urban District Council. Applications by Oct. 13.
WORKING FOREMAN (GAS). Nixon's Navigation Company, Mountain Ash.
DRAUGHTSMAN. No. 5289.
DRAUGHTSMEN. No. 5268.
REPRESENTATIVE. "Gas Works," c/o Streets.
SHOW ROOM ATTENDANT. No. 5292.
TRAVELLER. No. 5291.

Lectures, &c.

SIR JOHN CASS TECHNICAL INSTITUTE. Fuel, Fuel Analysis, and Gas Analysis. Syllabus from the Principal.
SCIENCE OF GAS MANUFACTURE AND COMBUSTION. Manchester University.

Agency Wanted (Australia).

"Gas," c/o W. Porteous and Co., Glasgow.

Plant, &c. (Second Hand), for Sale.

EXHAUSTER. T. Duxbury and Co., Manchester.
METERS. No. 5290.
STATION METER. Brynmawr and Blaina Gas Company.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY (BY AUCTION). Oct. 11.
BARNET GAS AND WATER COMPANY (BY AUCTION). Oct. 11.
BRISTOL WATER-WORKS COMPANY (BY AUCTION). Oct. 6.
DORKING WATER COMPANY (BY AUCTION). Oct. 18.
GREAT YARMOUTH WATER COMPANY (BY AUCTION). Oct. 11.
HARROW AND STANMORE GAS COMPANY (BY AUCTION). Oct. 11.
SOUTHEND WATER COMPANY (BY AUCTION). Oct. 18.

TENDERS FOR

Coal.

LANCASTER GAS DEPARTMENT. Tenders by Oct. 13.

Lead and Compo. Pipe and Block Tin.

RHONDDA URBAN DISTRICT COUNCIL. Tenders by Oct. 6.

Oxide (Spent).

SALFORD GAS DEPARTMENT. Tenders by Oct. 6.

Tar.

RHONDDA URBAN DISTRICT COUNCIL. Tenders by Oct. 6.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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General Manager (for England and Wales)—
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BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

READ HOLLIDAY AND SONS, LTD.,
HUDDERSFIELD,
Are prepared to Supply
BENZOL, TOLUOLE, NAPHTHA, AND CREOSOTE
in large Quantities.
ENQUIRIES SOLICITED.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
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JOHN W. LEITCH AND COMPANY,
MILNSBRIDGE CHEMICAL WORKS,
near HUDDERSFIELD.
The Manufacture of
PURE BENZOL FOR GAS ENRICHMENT
a speciality.

LUX'S GAS PURIFYING MASS.
See Advertisement on First White Page.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

WARNER & VAN DER BIESEN,
ZWOLLE, HOLLAND.
DIGGERS AND SUPPLIERS OF THE
FINEST DUTCH BOG-ORE.
(Natural Oxide of Iron.)
Best Percentages. For lowest Quotations to any Port, Station, or direct into Works, please apply to—
LONDON OFFICES: 6, LEATHER LANE, E.C.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

ROBERT DEMPSTER & SONS. Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

"HALLITE" Asbestos High-Pressure Sheeting.
Hallite Douglas, Limited, 106, Leadenhall Street, London, E.C.

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MEADE-KING, ROBINSON, & CO. Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, Exchange Street, Manchester, and Tower Building, 22, Water Street, Liverpool.

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

AMMONIACAL Liquor wanted.
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Telegrams: "Dacolight London." Telephone: 2336 Holborn.

AMMONIA Waste Liquor Disposal. Purification Plant.
Results Guaranteed. No Working Costs.
John Radcliffe, Chemical Engineer, East Barnet.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Aug. 23, p. 548.

M.H. (Methane Hydrogen) **GAS PLANT, LTD.,**
19, Great Winchester Street, LONDON, E.C.

The M.H. GAS PLANT produces at will :—
METHANE HYDROGEN GAS from Coke, Tar, Steam, and either Benzol or Tar enrichment.
BLUE WATER GAS from Coke and Steam.
CARBURETTED WATER GAS from Coke, Steam, and any Crude Oil.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, College Hill, London, E.C., and 25, Bridge End, Leeds.

TAR WANTED.
Telephone: Central Manchester, 7002.
Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS,
Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

AMMONIA. Consumers in any form are invited to correspond with Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
Read Holliday and Sons, Ltd., Huddersfield.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim House, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Worcs.
Telegrams: "Chemicals, Oldbury."

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

GAS TAR wanted,
Brotherton and Co., Ltd., Tar Distillers.
Works: Birmingham, Glasgow, Leeds, Liverpool, Sunderland, and Wakefield.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. John Nicholson & Sons, Ltd., Hunslet Chemical Works, Leeds. Tele.: "Nicholson, Leeds." Telephone: (Two lines), Nos. 2420 and 2421.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

IT is Worth Your While to Buy Direct from the RELIANCE LUBRICATING OIL COMPANY GUARANTEED ANTI-CORROSIVE LUBRICANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil, 1s. 6d.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil, 10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.; 650 T Cylinder, 1s. 9d.; Special Engine Oil, 1s. 4d.; Gas Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.; Renown Engine Oil, 11½d.; and Astral Disinfectant, 2s. 6d. per gallon. Barrels free, carriage paid. Solidified Oil, 25s. cwt.
The Reliance Lubricating Oil Company, 19 & 20, Water Lane, Tower St., London, E.C. Agents wanted.

SUCCESS by Saltation for most is improbable; the law of averages indicates system, backed by expert advice, as giving the surest results. Discard spasmodic, amateur efforts, and write now Herbert Greatorex, Application Specialist, Beechwood, Matlock.

CORRESPONDENCE CLASSES.

GAS Engineering and Gas Supply. City and Guilds of London Institute.
Teacher: HERBERT LEES (Silver Medallist), Assoc.M.Inst.C.E., Engineer and Manager of the Hexham Gas Company, Lecturer at Rutherford College, Newcastle-on-Tyne.
For Terms, &c., address Elvaston Road, Hexham.

CITY and Guilds—Courses in Gas Engineering and Supply (over 100 Passes and 6 Medals in Two Years), Structural Engineering and Heating and Ventilating (two new subjects) for the 1911 Examinations.
Correspondence College Company, Dept. W. 26, Green Street, Cambridge.

CITY and Guilds—Mr. Cranfield's Correspondence Classes in Gas Engineering and Gas Supply are now re-forming. Eleven Years' Experience in Training large numbers of Gas Students. Last Session's Examination results exceptionally good. Assistance ample, individual, and private.
Address, 11, Avondale Place, Halifax.

THE
Sir John Cass Technical Institute,
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Principal:
CHARLES A. KEANE, D.Sc., Ph.D., F.I.C.

The following Courses of Evening Lectures and Practical Work on

FUEL.

will be given during the Session, 1910-11.

LIQUID, GASEOUS, & SOLID FUEL.

By J. S. BRAME, Lecturer on Chemistry at the Royal Naval College, Greenwich.
A Course of Lectures, Monday Evenings, 7 to 8 p.m. Commencing **Monday, October 17, 1910.**

FUEL ANALYSIS.

By C. O. BANNISTER, Assoc.R.S.M., M.I.M.M.
A Course of Laboratory Work, Summer Term, Monday Evenings, 7 to 10 p.m. Commencing **Monday, April 24, 1911.**

GAS ANALYSIS.

By CHARLES A. KEANE, D.Sc., Ph.D., F.I.C.
A Course of Laboratory Work, Summer Term, Wednesday Evenings, 7 to 10 p.m. Commencing **Wednesday, April 26, 1911.**

The Courses of Instruction are arranged to meet the requirements of those engaged in Chemical and Engineering Works, or who are concerned with the use of Fuel as a Motive Power.
Detailed Syllabus of the Courses may be had upon Application at the Office of the Institute, or by letter to the **Principal.**

UNIVERSITY OF MANCHESTER.

Under the Auspices of the
MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS
AND THE
MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

A COURSE of Six Lectures will be given at the Victoria University on the "SCIENCE OF GAS MANUFACTURE AND COMBUSTION."
Admission free. Tickets for the Course and Full Particulars may be obtained from the Hon. Secretaries of the above Associations.
W. Whatmough, Engineer and Manager Gas-Works, Heywood;
J. Alsop, "Laymarice," Edgeley Road, Stockport.

THE Secretary of the Coatbridge Gas Company has to THANK the Applicants for the position of ASSISTANT MANAGER and to inform them that the DIRECTORS HAVE NOW MADE AN APPOINTMENT.

AGENCY—Gentleman with wide and extended Gas and General Engineering Experience trained in England, and now well Established in the Colonies, would accept a few approved AGENCIES for Australasia.
Address "Gas," Wm. Porteous and Co., Glasgow.

WASTE Inspector wanted with Experience in Reading Water-Meters and Working Deacon's Waste-Meters.
Apply, giving full Particulars, to the Secretary, Colne Valley Water Company, New Bushey, Watford.

WANTED, immediately, Two or Three DRAUGHTSMEN, fully Experienced in the Design of Modern Gas Plant.
Apply, by letter, Stating Age, Qualifications, and Salary required, to No. 5268, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a competent Gas-Fitter with Practical Knowledge of Gas Manufacture to act as WORKING FOREMAN at a small Gas-Works.
Apply, stating Age, Experience, and Wages required, and enclosing Testimonials, to W. Millar, Nixon's Navigation Company, Limited, Mountain Ash, South Wales.

REPRESENTATIVE required to introduce and push important article used in all Gas-Works. Must have Good Connections and be Good Salesman.
Please write, stating Qualifications, District, and References, to: "Gas-Works," care of Streets, 30, Cornhill, E.C.

WANTED by a Firm of Ironfounders and Chemical Engineers, with Established Trade among Chemical Manufacturers, to undertake the Sole Rights of Making and Selling Chemical Specialities in Great Britain.
Apply No. 5262, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

DRAUGHTSMAN Wanted in a Gas Engineer's and Contractor's Office. Must be Accurate and Reliable, also Competent to Design and Take Out Quantities for Coal-Gas Plant generally.
Apply, by letter, stating Age, Experience, and Salary required, to No. 5289, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Practical Working Manager for the Beaumaris Corporation Water-Works. Population, 2000. Gravitation Supply. Must understand care of Filters, Mains, Inspection for Leakage, and General Administration. No Book-Keeping.
Applications, stating Salary, to be sent in by Tuesday, the 4th of October, to the Town Clerk, Beaumaris.

WANTED by a Suburban Gas Company, a SHOW-ROOM ATTENDANT. Must have occupied a similar Position and have a thorough knowledge of Gas Lighting and of Gas Cookers, Fires, and Appliances.
Apply, by letter, stating Qualifications and Salary expected, to No. 5292, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Traveller for an old Established Company supplying Gas Companies and Corporations. Salary, expenses, and Commission. Must have Good Connection with Gas Companies in England.
Write, stating Qualifications and previous Experience, to No. 5291, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

RHONDDA URBAN DISTRICT COUNCIL.
(Gas and Water Department.)

THE Rhondda Urban District Council require the Services of a Man who will have to DEVOTE HIS WHOLE TIME to the work of DETECTING AND REDUCING GAS LEAKAGES throughout the area supplied by the Council.
Only those who have had a thorough Practical Experience in districts where subsidences occur need Apply.
Applications, with *copies* of Three recent Testimonials, stating Age, Experience, and Wages required, to be addressed to the Chairman of the Gas and Water Committee, endorsed "Gas Inspector," to be sent to the undersigned not later than Monday, the 3rd of October next.

Walter P. Nicholas,
Clerk of the Council.
Council Offices, Pentre,
Rhondda, Sept. 19, 1910.

FOR SALE—30,000 Cubic Feet an Hour EXHAUSTER. Good as New. Done very little work. Maker, Bryan Donkin and Co.

Can be seen on Application to THOS. DUXBURY AND Co., 16, Deansgate, MANCHESTER.

FOR SALE—One Cylindrical Station METER. Capacity 6000 Cubic Feet per Hour, complete with Hydraulic Valves and Bye-Pass, in good Working Condition. No reasonable Offer refused.

Offers to D. ARTHUR PRICE, Secretary, Brynmawr and Blaina Gas Company, BLAINA, MON.

GASHOLDERS—16 ft., 24 ft., 26 ft., and 45 ft. Diameter GASHOLDERS, Cheap for immediate Sale. Re-erected in either Brick or New Steel Tanks Complete to Plan and Specification. Can be seen Temporarily Erected at our Works.

FIRTH BLAKELEYS, Thornhill, DEWSBURY.

FOR SALE—A quantity of Second-Hand Dry GAS METERS—Two-Light, 50-Light, 100 Light, 150-Light, 200-Light, and 300-Light; also 150 Wet Consumers' METERS, all by well-known Makers. Newly Repaired and Guaranteed for Two Years.

Address No. 5290, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Purchase of about 1800 Tons of SPENT OXIDE.

Full Particulars and Form of Tender may be obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Spent Oxide," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 6th of October, 1910.

L. C. EVANS,
Town Clerk.

Salford.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council are prepared to receive TENDERS for the Supply of LEAD and COMPO PIPE and BLOCK TIN, for the Half Year ending March 31, 1911.

Form of Tender may be obtained on Application to Mr. Octavius Thomas, Engineer and Manager, Gas and Water Offices, Pentre, Rhondda.

No Form of Tender other than that issued by the Council will be considered.

The Contractors will be required to pay the Standard Rate of Wages recognized in the District.

Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed "Tender for Lead Pipe, &c.," and sent to the undersigned not later than Ten a.m. on Thursday, Oct. 6, next.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk of the Council.

Council Offices, Pentre,
Rhondda, Sept. 23, 1910.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council are prepared to re- ceive OFFERS for the Purchase of the Surplus GAS TAR made at the Two Gas-Works, Porth and Ystrad, for a Term of One Year from Nov. 1, 1910 (or for such longer Term as may be contracted for with the consent of the Council).

The Tar will be delivered free into Contractor's and Council Tank Waggons.

Tenders to be sent addressed to the Chairman of the Gas and Water Committee, endorsed "Tar," and delivered at my Office not later than Ten a.m. on Thursday, Oct. 6, prox.

The Purchaser will be required to enter into an Agreement with the Council for the due performance of his Contract.

The Council do not bind themselves to accept the highest or any Tender.

Form of Tender and Specification may be obtained on Application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, Rhondda.

WALTER P. NICHOLAS,
Clerk of the Council.

Council Offices, Pentre,
Rhondda, Sept. 23, 1910.

BRISTOL WATER-WORKS COMPANY.

SALE OF ORDINARY STOCK.

MESSRS. JOHN E. PRITCHARD & CO., late Alexander, Daniel, and Co., will SELL BY AUCTION, at the Bank Auction Mart, Colston Avenue, Bristol, on Thursday, the 6th of October, 1910, at Three o'clock in the Afternoon,

£15,000

BRISTOL WATER-WORKS SEVEN PER CENT. MAXIMUM CONSOLIDATED ORDINARY STOCK, in Lots of £100, at the reserved price of £136 for every £100 Stock.

The above £15,000 Stock is part of the Seven per cent. Maximum Consolidated Ordinary Stock, amounting to £970,000, created under the powers of the Bristol Water-Works Acts, 1888, 1889, 1895, and 1902.

The Dividend is subject to proportionate diminution whenever the maximum dividend to which each class of Ordinary Shares or Ordinary Stock of the Company is entitled shall not be paid in full, but such diminution may be made up in subsequent years.

For further Particulars and Conditions of Sale, Apply to the AUCTIONEERS, Bank Buildings, Colston Avenue, BRISTOL; to Messrs. EDWARD GERRISH, HARRIS, AND COMPANY, Lloyds Bank Buildings, Corn Street, BRISTOL; or to

ALFRED J. ALEXANDER,
Secretary and General Manager.

Bristol Water-Works Office,
Telephone Avenue, Bristol.

CORPORATION OF LANCASTER.
(GAS DEPARTMENT.)

TENDERS FOR GAS SLACK.

THE Gas Committee are prepared to receive TENDERS for the Supply of Rough GAS SLACK, to be delivered on the Gas-Works Siding, Lancaster, in such Quantities, and at such times, as may be required during a period of Twelve Months, commencing delivery Jan. 1, 1911.

Sealed Tenders, endorsed "Gas Slack," giving full Particulars of the Slack offered, must be delivered to T. C. Hughes, Esq., Town Clerk, Lancaster, not later than Oct. 13 next.

Any further Information and Forms of Tender may be obtained on Application to the undersigned.

C. ARMITAGE,
Manager.

Gas-Works, Lancaster.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 500 £10 "C" SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

NEW ISSUE OF £3500 "C" CONSOLIDATED STOCK,
AND
£3500 FOUR PER CENT. CONSOLIDATED PREFERENCE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £10,000 "D" CAPITAL WATER STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GREAT YARMOUTH WATER-WORKS COMPANY.

NEW ISSUE OF £4000 NEW ORDINARY STOCK,
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 1000 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Trustees of CHAS. KING, Esq., decd.
DORKING WATER COMPANY.

80 £10 FIVE PER CENT. "B" PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

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Owners of the Birtley Iron Works and Pelaw Main Collieries,
GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our manufactures, on application.

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Newcastle-on-Tyne Offices: MILBURN HOUSE.

COOKE, ENNEVER & TULK,
Stock Brokers,
17 & 18, NEWGATE STREET, E.C., and PRINCE'S CHAMBERS, BIRMINGHAM.

We are Buyers and Sellers by Private Treaty of Stocks, Shares, and Debentures in approved Old Established Water or Gas Undertakings, and make this a speciality. Prices quoted on Application.

New Capital issued, Municipal Loans arranged.
COOKE, ENNEVER & TULK,
'Phone City 4660. Tele.: "BIPUNCTUAL LONDON."

KOPPERS' PATENT
CHAMBER OVENS.

Results obtained which have never been Surpassed by any other System of Carbonization.

Plants at Work and under Construction for the production of **18,000,000** cubic feet of Gas per Day.

See our large Advertisement appearing in alternate issues of the "JOURNAL."

The KOPPERS'
COKE OVEN AND BYE-PRODUCT CO.,
301, Glossop Road, SHEFFIELD.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND
ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

ALL the
BOYS CALORIMETERS
which have been in daily use in all the Official Testing-Stations in London for the last Three Years
WERE MADE BY
JOHN J. GRIFFIN & SONS,
— LIMITED —
KINGSWAY, LONDON, W.C.
Those desiring to obtain Gas Calorimeters as used in the Official Testing Places should see that the apparatus bears the name of the Original makers.
Descriptive Catalogue on Application.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
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Workmanship and Materials of the Highest Quality.
PECKETT'S LOCOMOTIVES.
Built to any Specification or Gauge.
PECKETT & SONS,
ATLAS LOCOMOTIVE WORKS, BRISTOL.

THE WIGAN COAL & IRON CO., LIMTD.,
Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.
MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone: No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents. Telegraphic Address: "PARKER, LONDON."

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"the Star of the Mantle World," still **holds the field** for Strength and Light, as users have proved for themselves. The Company have recently quadrupled their powers of production to meet the great demand. **Facts speak for themselves.**
The Company are now prepared to negotiate large contracts, and guarantee prompt deliveries.
AWARDED GOLD MEDAL, FRANCO-BRITISH EXHIBITION.
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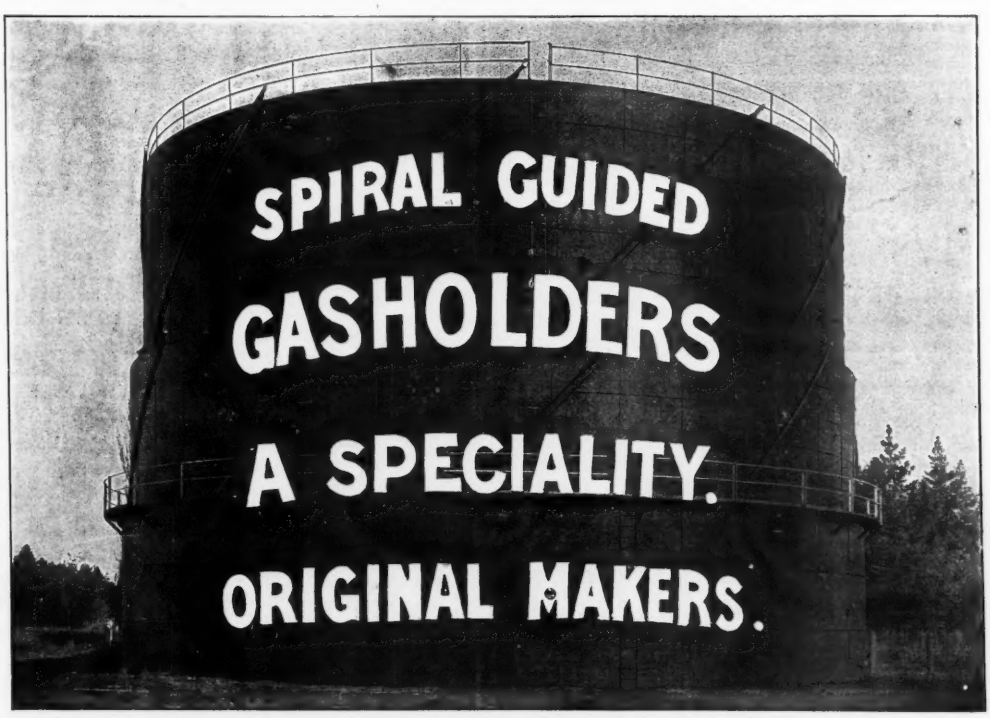

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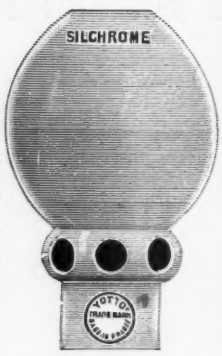

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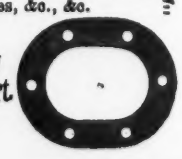

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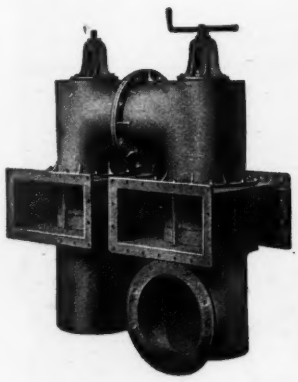

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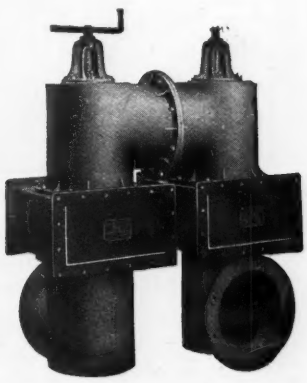
fixed inside or outside the Purifiers.



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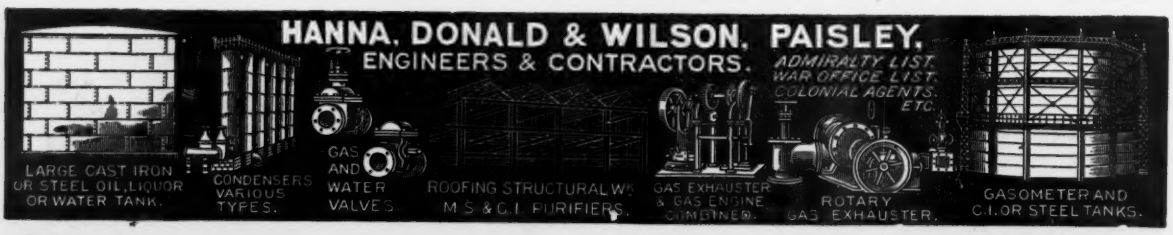
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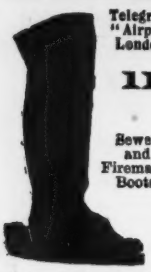

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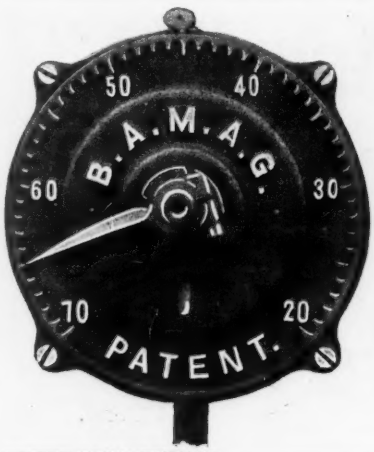

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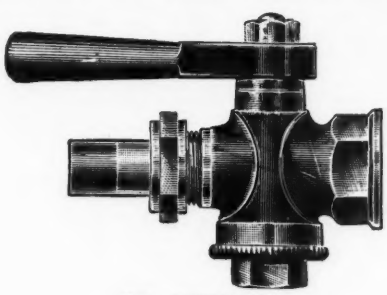
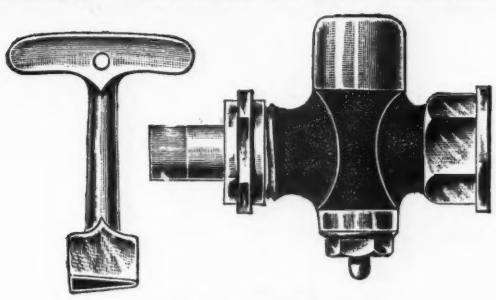


D1 PATTERN.



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Manufacture best quality only of every description of Inclined, Horizontal, and Segment Retorts, Lumps, Blocks, Water-Gas Blocks, and Checker Bricks.

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"BLUE" OR "CARBURETTED" W.-G.

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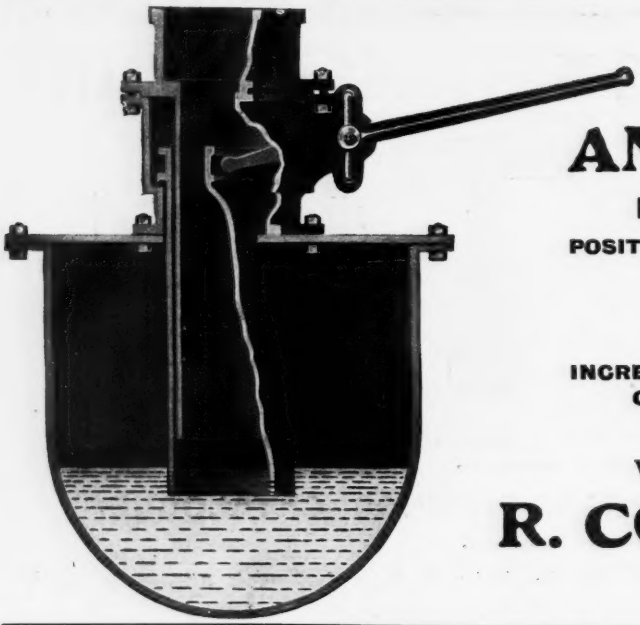

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Welsbach
LIGHT
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
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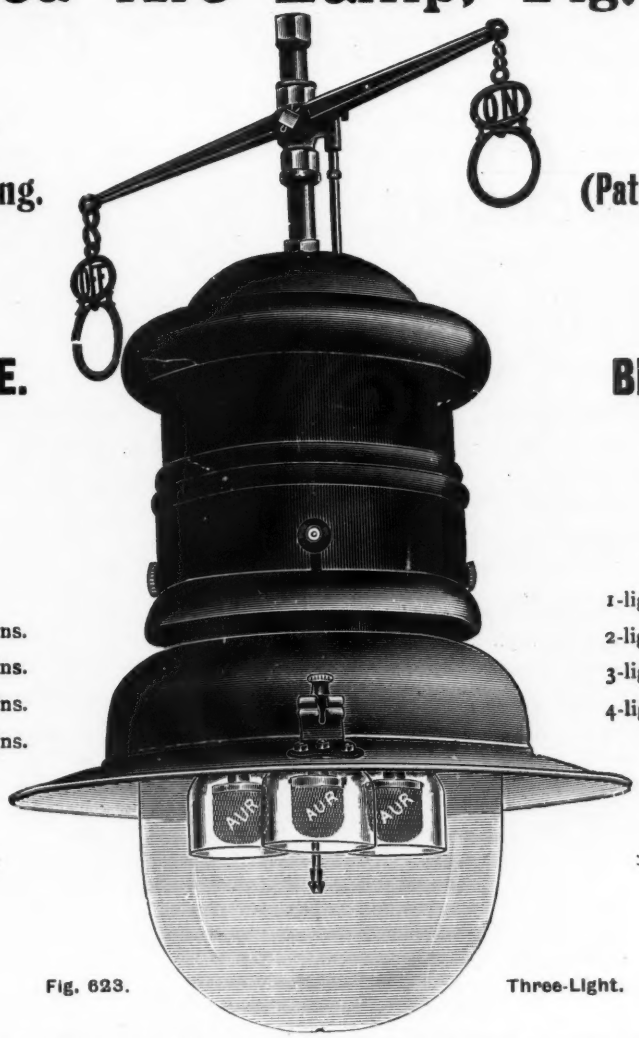

Fig. 623. Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
„ „ „ In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

		1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra	each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra	„	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, **4½d.** each, or **4s. 3d.** per dozen, subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

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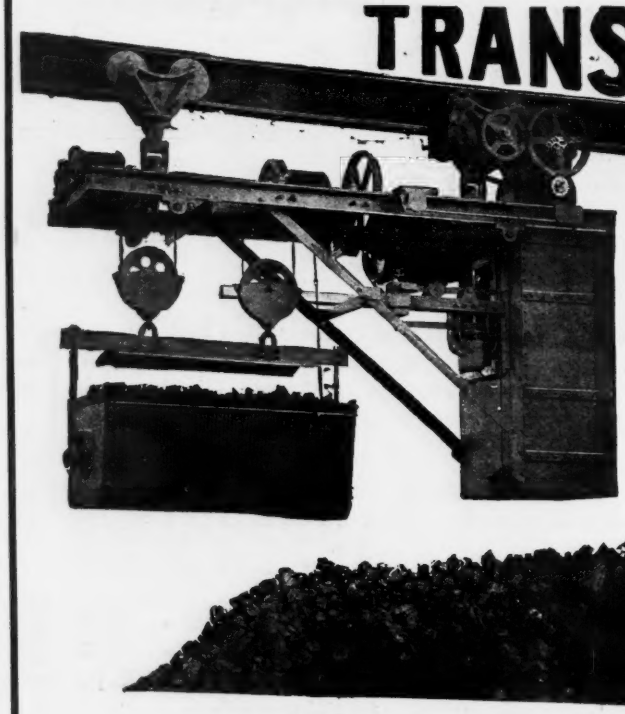

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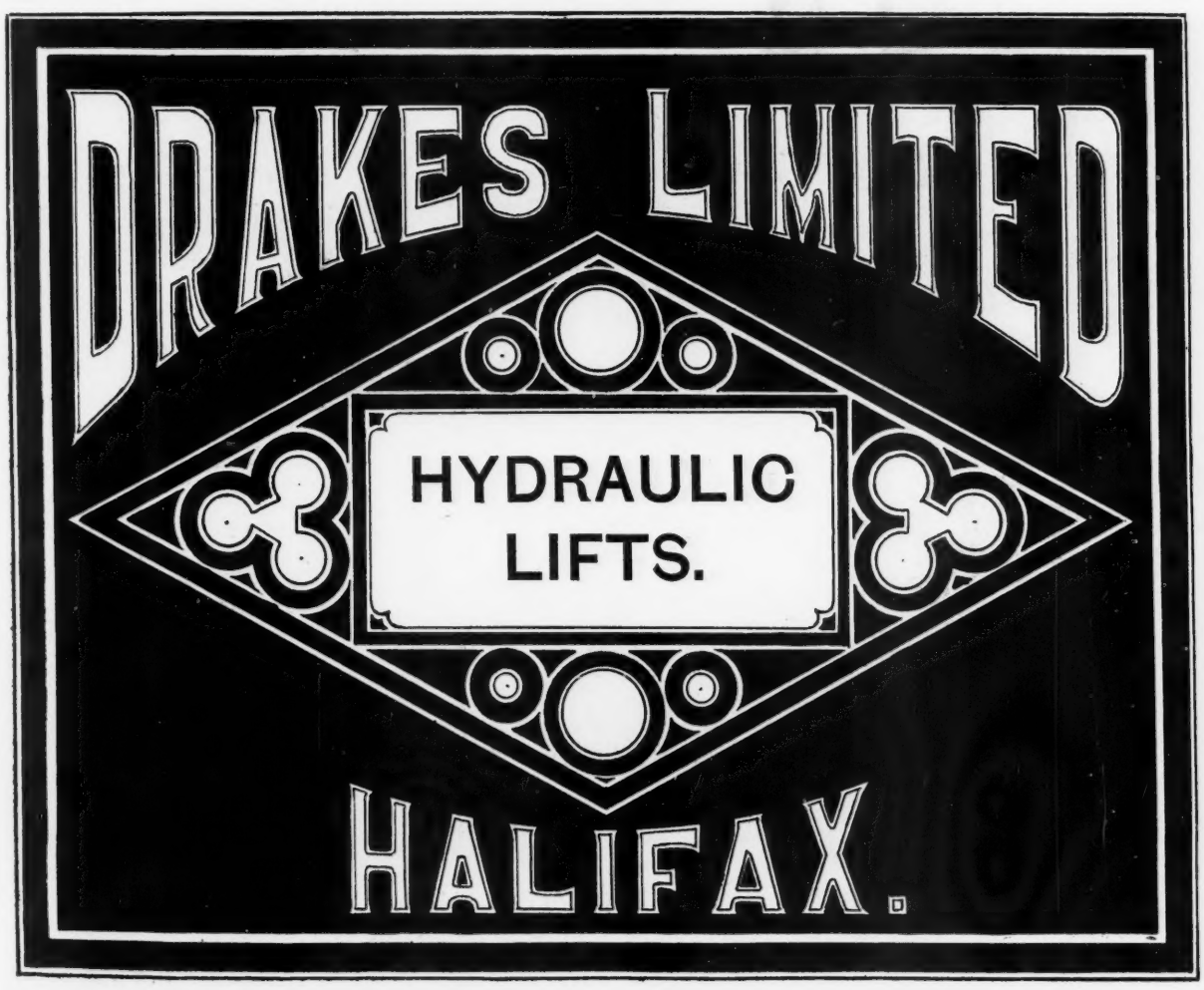

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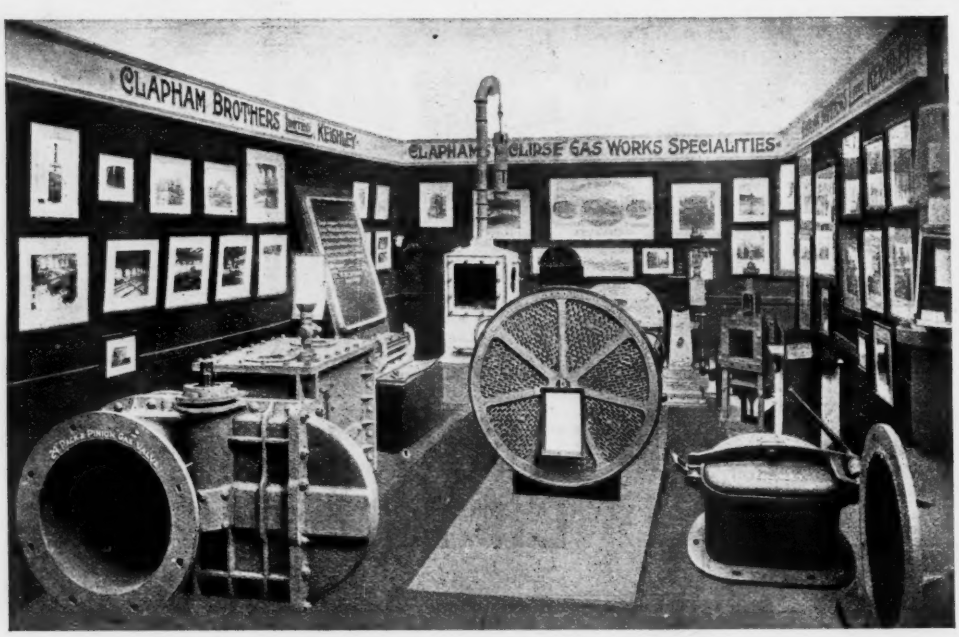

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